Appendix A
Scoping Documents

SLOVER DISTRIBUTION CENTER

DRAFT

ENVIRONMENTAL IMPACT REPORT

COUNTY OF SAN BERNARDINO
NOTICE OF AVAILABILITY (NOA) / NOTICE OF INTENT (NOI) TO ADOPT
AN INITIAL STUDY / NEGATIVE DECLARATION
Bloomington Business Center – JM Realty Group, LLC

In accordance with the California Environmental Quality Act (CEQA) and the CEQA Guidelines, County Staff prepared a Draft Initial Study / Negative Declaration (IS/ND) that identify and evaluate the environmental impacts of the Bloomington Business Center.

Project Title: Bloomington Business Center – JM Realty Group, LLC

Project No.: P201400241

Project Location: Slover Avenue, extending between Laurel Avenue and Locust Avenue

Project Description: A) General Plan Amendment to change the official land use zoning district from Bloomington/Single Residential with a 20,000 minimum lot size, additional agricultural overlay (BL/RS-20M-AA) & Bloomington/Single Residential with a one acre minimum lot size – additional agriculture overlay (BL/RS-1-AA) to Bloomington/Community Industrial on 17.34 acres. B) Conditional Use Permit to establish a 344,000 square foot "high cube" warehouse facility on 17.34 acres.

Environmental Review and Public Comment: The circulation of the Draft Negative Declaration\ Initial Study is to encourage written public comments. Interested persons can review the Draft IS/ND at the following physical location:

Land Use Services Department - Planning Division
385 North Arrowhead Avenue, First Floor
San Bernardino, CA 92415-0187

You may obtain the document in electronic format at www.sbcounty.gov/uploads/LUS/Environmental/JMRealty/JMRealtyMND-IS.pdf or by emailing the Planner at kwhite@lusd.sbcounty.gov. To request a PDF version of the document from the Land Use Services Department database, please reference the project number above.

The comment period on the IS/ND closes on **January 29, 2014 at 4:30 PM.** Please submit comments to kwhite@lusd.sbcounty.gov or to:

Kevin White, Senior Planner
909-387-3067
County of San Bernardino
Land Use Services Department - Planning Division
385 North Arrowhead Avenue, First Floor
San Bernardino, CA 92415-0187

San Bernardino County
Land Use Services Department
Planning Division
385 North Arrowhead Avenue, 1st Floor • San Bernardino, CA 92415
Phone Number: (909) 387-8311 Fax Number: (909) 387-3223

NOTICE OF PREPARATION

FROM: San Bernardino County Land Use Services Department
385 North Arrowhead Avenue, First Floor
San Bernardino, CA 92415-0187

TO: Interested Agencies, Organizations, and Individuals

DATE: January 12, 2017

SUBJECT: **Notice of Preparation of a Draft Environmental Impact Report (EIR)**

The County of San Bernardino (County), as the Lead Agency under the California Environmental Quality Act (CEQA), will be coordinating the preparation of an Environmental Impact Report (EIR) for the proposed Bloomington Business Center Project. The County is requesting identification of environmental issues and information that you or your organization believes should be considered in the EIR.

Project Title: Bloomington Business Center

Project Applicant: JM Realty Group, LLC

Assessor's Parcel Number(s): 0256-041-01 02, 03, 47, and 48

Project Location: The Project site is located in San Bernardino County in the unincorporated community of Bloomington. Bloomington is generally located east of the City of Fontana and north of Riverside County, south of the City of Rialto, and west of the City of Colton. The Project site is located on the southeast corner of Slover Avenue and Laurel Avenue, and extends to the southwest corner of Slover Avenue and Locust Avenue. The Project site is approximately 17.34 acres in size.

The project site consists of five parcels, four of which are vacant and one which has an existing single family residence that is proposed to be demolished (APN 0256-041-48). The project site is generally flat with a slight decline in elevation from the north side at 1,077 feet above mean sea level (amsl) to the southern edge at 1,027 amsl.

Approximately 16 acres of the overall project site contains open fields with annual grassland. This portion of the site is highly disturbed due to a history of disking. This portion of the site also contains piles of refuse and soils. The remaining portion of the site (approximately 1 acre) includes a single family residence, trees, ornamental landscaping, and a fenced yard.

Project Background: In 2015, the County prepared an Initial Study for the Project in compliance with the California Environmental Quality Act ("CEQA") pursuant to Public Resources Code Section 21000, et seq., and the State CEQA Guidelines (California Code of Regulations Section 15000, et seq.). Although the Initial Study identified potentially significant impacts, the County determined that revisions to the Project plans would avoid or mitigate the effects to a point where no significant effects would occur, and that there was no substantial evidence that the Project, as revised, would have a significant effect on the environment. Accordingly, the County elected to prepare a Mitigated Negative Declaration ("MND") for the Project. The County circulated the Mitigated Negative Declaration for the Project on December 28, 2015 (State Clearinghouse No. 2015121102).

During the public review process, the County received comment letters outlining perceived inadequacies in the MND relating to the County's environmental analysis of the Project. Notwithstanding the County and the Applicant's opinion that the previously prepared MND was adequate and fully complied with CEQA, the County has elected to prepare an Environmental Impact Report ("EIR") for the Project.

Project Description: The proposed Project is comprised of the following elements:

1. General Plan Amendment to change the existing land use designation from Bloomington/Residential 20,000 minimum lot size-additional agricultural overlay (BL/RS-20M-AA) and Bloomington/Single Residential with a one acre minimum lot size (BL/RS-1AA) to Bloomington/ Community Industrial (BL/IC) on approximately 17.34 acres;
2. Conditional Use Permit (CUP) to construct a 344,000-square-foot (ft^2) high cube industrial warehouse building and associated facilities and improvements.

The project would include the development of a 344,000 square foot high cube warehouse facility. The project would also include associated truck and passenger vehicle parking, fences, gates, hardscape areas, as well as some ornamental trees and vegetation.

Potential Environmental Effects: An EIR will be prepared to evaluate the proposed Project's environmental impacts and analyze project alternatives. The topic areas anticipated to be analyzed in detail in the EIR include: Air Quality, Greenhouse Gas Emissions, Health Risks, Hazards and Hazardous Materials, Land Use and Planning, Noise, and Traffic.

Public Review Period: January 12, 2017 to February 10, 2017

Responses and Comments: Please send your responses and comments by February to Kevin White, Senior Planner at Kevin.White@lus.sbcounty.gov or at the following address:

Kevin White, Senior Planner
County of San Bernardino
Land Use Services Department – Planning Division
385 North Arrowhead Avenue, First Floor
San Bernardino, CA 92415-0187

Scoping Meeting: The County will hold a scoping meeting for the project to receive comments on the scope and content of the EIR. You are welcome to attend the scoping meeting and present environmental information that you believe should be considered in the EIR. The scoping meeting is scheduled as follows:

Date: January 25, 2017
Time: 6:00pm
Place: Bloomington Senior Center
18313 Valley Blvd.
Bloomington, CA 92316

Agencies: In accordance with California Code Regulations, Title 14, Section 15082 (b), the County requests your agency's view on the scope and content of the environmental information relevant to your agency's statutory responsibilities in connection with the proposed project. Your agency may need to use the EIR prepared by the County when considering any permits that your agency must issue, or other approval for the project.

Document Availability:

This Notice of Preparation can be viewed on the County of San Bernardino website at: http://cms.sbcounty.gov/lus/Planning/Environmental/Valley.aspx. The notice is also available during regular business hours at:

- County of San Bernardino Land Use Services Department, Planning Division, 385 North Arrowhead Avenue, San Bernardino, CA 92415; between the hours of 8:00 a.m. and 4:30 p.m., Monday through Friday.

- Bloomington Branch Library, 18028 Valley Blvd. , Bloomington, CA 92316; (909) 820-0533; Library Hours: Monday – Wednesday 11:00 a.m. to 7:00 p.m., Thursday 10:00 a.m. to 6:00 p.m., Saturday 9:00 a.m. to 5:00 p.m. This branch is closed Friday and Sunday.

If you require additional information please contact Kevin White, Senior Planner, at (909) 387-3067.

Michael Baker
INTERNATIONAL

We Make a Difference

MEMORANDUM

Date: January 26, 2017

Subject: Bloomington Business Center Project (Project)
Summary of Oral Comments from Scoping Meeting

The County of San Bernardino (County) held a Project Scoping Meeting on January 25, 2017 from 6:00 pm to 8:00 pm at 18317 Valley Boulevard, Bloomington CA. The meeting gave the community the opportunity to provide input on the range of environmental issues to be addressed in the Draft Environmental Impact Report being prepared to address California Environmental Quality Act requirements for the County's consideration of the proposed Project. The meeting was attended by ten (10) people who self-identified as a resident and or community leader/organizer.

This document summarizes public oral scoping comments provided at the meeting.

Traffic and Circulation
The following are stated concerns regarding traffic issues that could arise from the Project:

- A resident owns a property just behind the Project site, and believes he will be heavily affected by traffic. Currently, it takes about 40 minutes to get through the streets to get to the nearby school, a problem directly related to traffic during peak hours. With the added truck and employee traffic, things will only get much worse for their community.
- Erica Flores (Community Organizer) and other residents showed concern regarding the amount of traffic that would be added to the community as well.
- Concerns regarding trucks taking residential streets to park and eventually take over.
- Concern regarding road damage/maintenance.

Air Quality and Hazardous Materials

- Concern about the potential of air quality pollution to sensitive receptors (nearby school, church, and adjacent residents) due to on-site construction and Project operation.
- Concerns about the added particulate matter that neighbors will be exposed to.
- Comment regarding CAL-EPA and their recommendation for warehouses to be located no less than (1,000) feet from any residence.
- Potential for cancer/asthma health risks due to particulate matter as stated in a Loma Linda University Health Study.
- Diesel pollution

Environmental Justice

- Concern regarding the fact that Scoping Notices where not sent out to the community in Spanish or other languages other than English since the community is heavily populated by minority groups.
- Concerns about overall cumulative impacts to sensitive receptors (i.e., schools, church, residents).
- Concerns regarding the potential for quality of life degradation.
- SB 1000

Noise

- Currently, noise nuisance of existing adjacent warehouse buildings are a problem on a weekend basis because of alarms on warehouses going off and no one is there to shut them off. Similarly, this is a concern with the proposed Project, especially since it is so close to residential units.
- Noise created by truck traffic is also a concern.
- Sleep disturbance

Land Use/Regulations

- Concern about Land Use consistency between current zone designation and proposed project.
- Concerns regarding the radius at which a warehouse is supposed to be situated according to the recommendation made by CARB.
- One of the main reasons why residents first purchased homes just south of the proposed project site was because the Land Use designation stated that there would be homes where the Project is now being proposed.

Lighting

- Concern about the potential of lighting pollution and associated effects such as sleep disturbance from lighting projecting into neighboring homes.

Views

- Concern about the scenic view obstruction that would result to residents south of the Project site with the implementation of the ‘High Cube’ warehouse.

Other

- Concern regarding property values.

State of California - Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Inland Deserts Region
3602 Inland Empire Blvd., Suite C-220
Ontario, CA 91764
(909) 484-0167
www.wildlife.ca.gov

EDMUND G. BROWN, Jr., Governor
CHARLTON H. BONHAM, Director

February 7, 2017
Sent via email

Mr. Kevin White
Senior Planner
County of San Bernardino
Land Use Services Department - Planning Division
385 N. Arrowhead Avenue, 1st Floor
San Bernardino, CA 92415
Kevin.White@lus.sbcounty.gov

Subject: Notice of Preparation of a Draft Environmental Impact Report
Bloomington Business Center
State Clearinghouse No. 2015121102

Dear Mr. White:

The Department of Fish and Wildlife (Department) appreciates the opportunity to comment on the Notice of Preparation (NOP) of a Draft Environmental Impact Report (DEIR) for the Bloomington Business Center (project) [State Clearinghouse No. 2015121102]. The Department is responding to the NOP as a Trustee Agency for fish and wildlife resources (California Fish and Game Code Sections 711.7 and 1802, and the California Environmental Quality Act [CEQA] Guidelines Section 15386), and as a Responsible Agency regarding any discretionary actions (CEQA Guidelines Section 15381), such as the issuance of a Lake or Streambed Alteration Agreement (California Fish and Game Code Sections 1600 *et seq.*) and/or a California Endangered Species Act (CESA) Permit for Incidental Take of Endangered, Threatened, and/or Candidate species (California Fish and Game Code Sections 2080 and 2080.1).

The approximately 17.34-acre project site is located north of Mindanao Street and existing residential development, east of Laurel Avenue, south of Slover Avenue, and west of Locust Street; within the unincorporated community of Bloomington, in the County of San Bernardino, California.

The project proposes the development of the project site with a 344,000 square foot "high cube" warehouse facility, as well as truck and passenger vehicle parking, fences, gates, hardscape areas, and landscaping. The project site includes five parcels, four of which are vacant and one of which has an existing single family residence that is proposed to be demolished.

COMMENTS AND RECOMMENDATIONS

The Department has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of those species (i.e., biological resources); and administers the Natural Community Conservation Planning Program (NCCP Program). The Department offers the comments and recommendations presented below to assist the County of San Bernardino (County; the CEQA lead agency) in adequately identifying and/or mitigating the project's significant, or potentially significant, impacts on biological resources. The comments and recommendations are also offered to enable the Department to adequately review and comment on the proposed project with respect to impacts on biological resources.

The Department recommends that the forthcoming DEIR address the following:

Assessment of Biological Resources

Section 15125(c) of the CEQA Guidelines states that knowledge of the regional setting of a project is critical to the assessment of environmental impacts and that special emphasis should be placed on environmental resources that are rare or unique to the region. To enable Department staff to adequately review and comment on the project, the DEIR should include a complete assessment of the flora and fauna within and adjacent to the project footprint, with particular emphasis on identifying rare, threatened, endangered, and other sensitive species and their associated habitats.

The Department recommends that the DEIR specifically include:

1. An assessment of the various habitat types located within the project footprint, and a map that identifies the location of each habitat type. The Department recommends that floristic, alliance- and/or association based mapping and assessment be completed following *The Manual of California Vegetation*, second edition (Sawyer et al. 2009). Adjoining habitat areas should also be included in this assessment where site activities could lead to direct or indirect impacts offsite. Habitat mapping at the alliance level will help establish baseline vegetation conditions;

2. A general biological inventory of the fish, amphibian, reptile, bird, and mammal species that are present or have the potential to be present within each habitat type onsite and within adjacent areas that could be affected by the project. The Department's California Natural Diversity Database (CNDDB) in Sacramento should be contacted at (916) 322-2493 or CNDDB@wildlife.ca.gov to obtain current information on any previously reported sensitive species and habitat, including Significant Natural Areas identified under Chapter 12 of the Fish and Game Code, in the vicinity of the proposed project. The Department recommends that CNDDB Field Survey Forms be completed and submitted to CNDDB to document survey results. Online forms can be obtained and submitted at: https://www.wildlife.ca.gov/Data/CNDDB/Submitting-Data

Please note that the Department's CNDDB is not exhaustive in terms of the data it houses, nor is it an absence database. The Department recommends that it be used as a starting point in gathering information about the *potential presence* of species within the general area of the project site.

3. A complete, *recent* inventory of rare, threatened, endangered, and other sensitive species located within the project footprint and within offsite areas with the potential to be effected, including California Species of Special Concern (CSSC) and California Fully Protected Species (Fish and Game Code § 3511). Species to be addressed should include all those which meet the CEQA definition (CEQA Guidelines § 15380). The inventory should address seasonal variations in use of the project area and should not be limited to resident species. Focused species-specific surveys, completed by a qualified biologist and conducted at the appropriate time of year and time of day when the sensitive species are active or otherwise identifiable, are required. Acceptable species-specific survey procedures should be developed in consultation with the Department and the U.S. Fish and Wildlife Service, where necessary. Note that the Department generally considers biological field assessments for wildlife to be valid for a one-year period, and assessments for rare plants may be considered valid for a period of up to three years. Some aspects of the proposed project may warrant periodic updated surveys for certain sensitive taxa, particularly if the project is proposed to occur over a protracted time frame, or in phases, or if surveys are completed during periods of drought.

   Based on the Department's local biological knowledge of the project area, and review of CNDDB, the project site has a high potential to support both nesting and foraging habitat for burrowing owl (*Athene cunicularia*), a California Species of Special Concern. As such, the Department recommends that the County, during preparation of the DEIR, follow the recommendations and guidelines provided in the Staff Report on Burrowing Owl Mitigation (Department of Fish and Game, March 2012); available for download from the Department's website at: https://www.wildlife.ca.gov/Conservation/Survey-Protocols

   The Staff Report on Burrowing Owl Mitigation specifies that project impact evaluations include:

   a. A habitat assessment;
   b. Surveys; and
   c. An impact assessment

   As stated in the *Staff Report on Burrowing Owl Mitigation*, the three progressive steps are effective in evaluating whether a project will result in impacts to burrowing owls, and the information gained from the steps will inform any subsequent avoidance, minimization, and mitigation measures. Habitat assessments are conducted to evaluate the likelihood that a site supports burrowing owl. Burrowing

owl surveys provide information needed to determine the potential effects of proposed projects and activities on burrowing owls, and to avoid take in accordance with Fish and Game Code sections 86, 3503, and 3503.5. Impact assessments evaluate the extent to which burrowing owls and their habitat may be impacted, directly or indirectly, on and within a reasonable distance of a proposed CEQA project activity or non-CEQA project.

4. A thorough, recent, floristic-based assessment of special status plants and natural communities, following the Department's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (see https://www.wildlife.ca.gov/Conservation/Plants);

5. Information on the regional setting that is critical to an assessment of environmental impacts, with special emphasis on resources that are rare or unique to the region (CEQA Guidelines § 15125[c]);

Analysis of Direct, Indirect, and Cumulative Impacts to Biological Resources

The DEIR should provide a thorough discussion of the direct, indirect, and cumulative impacts expected to adversely affect biological resources as a result of the project. To ensure that project impacts to biological resources are fully analyzed, the following information should be included in the DEIR:

1. A discussion of potential impacts from lighting, noise, human activity, and wildlife-human interactions created by zoning of development projects or other project activities adjacent to natural areas, exotic and/or invasive species, and drainage. The latter subject should address project-related changes on drainage patterns and water quality within, upstream, and downstream of the project site, including: volume, velocity, and frequency of existing and post-project surface flows; polluted runoff; soil erosion and/or sedimentation in streams and water bodies; and post-project fate of runoff from the project site.

2. A discussion of potential indirect project impacts on biological resources, including resources in areas adjacent to the project footprint, such as nearby public lands (e.g. National Forests, State Parks, etc.), open space, adjacent natural habitats, riparian ecosystems, wildlife corridors, and any designated and/or proposed reserve or mitigation lands (e.g., preserved lands associated with a Natural Community Conservation Plan, or other conserved lands).

3. An evaluation of impacts to adjacent open space lands from both the construction of the project and long-term operational and maintenance needs.

4. A cumulative effects analysis developed as described under CEQA Guidelines § 15130. Please include all potential direct and indirect project related impacts to riparian areas, wetlands, vernal pools, alluvial fan habitats, wildlife corridors or wildlife

movement areas, aquatic habitats, sensitive species and other sensitive habitats, open lands, open space, and adjacent natural habitats in the cumulative effects analysis. General and specific plans, as well as past, present, and anticipated future projects, should be analyzed relative to their impacts on similar plant communities and wildlife habitats.

Alternatives Analysis

Note that the DEIR must describe and analyze a range of reasonable alternatives to the project that are potentially feasible, would "feasibly attain most of the basic objectives of the project," and would avoid or substantially lessen any of the project's significant effects (CEQA Guidelines § 15126.6[a]).

Mitigation Measures for Project Impacts to Biological Resources

The DEIR should include appropriate and adequate avoidance, minimization, and/or mitigation measures for all direct, indirect, and cumulative impacts that are expected to occur as a result of the construction and long-term operation and maintenance of the project. When proposing measures to avoid, minimize, or mitigate impacts, the Department recommends consideration of the following:

1. *Fully Protected Species*: Fully protected species may not be taken or possessed at any time. Project activities described in the DEIR should be designed to completely avoid any fully protected species that have the potential to be present within or adjacent to the project area. The Department also recommends that the DEIR fully analyze potential adverse impacts to fully protected species due to habitat modification, loss of foraging habitat, and/or interruption of migratory and breeding behaviors. The Department recommends that the Lead Agency include in the analysis how appropriate avoidance, minimization and mitigation measures will reduce indirect impacts to fully protected species.

2. *Sensitive Plant Communities*: The Department considers sensitive plant communities to be imperiled habitats having both local and regional significance. Plant communities, alliances, and associations with a statewide ranking of S-1, S-2, S-3, and S-4 should be considered sensitive and declining at the local and regional level. These ranks can be obtained by querying the CNDDB and are included in *The Manual of California Vegetation* (Sawyer et al. 2009). The DEIR should include measures to fully avoid and otherwise protect sensitive plant communities from project-related direct and indirect impacts.

3. *Mitigation*: The Department considers adverse project-related impacts to sensitive species and habitats to be significant to both local and regional ecosystems, and the DEIR should include mitigation measures for adverse project-related impacts to these resources. Mitigation measures should emphasize avoidance and reduction of project impacts. For unavoidable impacts, onsite habitat restoration and/or

enhancement should be evaluated and discussed in detail. If onsite mitigation is not feasible or would not be biologically viable and therefore not adequately mitigate the loss of biological functions and values, offsite mitigation through habitat creation and/or acquisition and preservation in perpetuity should be addressed.

The DEIR should include measures to perpetually protect the targeted habitat values within mitigation areas from direct and indirect adverse impacts in order to meet mitigation objectives to offset project-induced qualitative and quantitative losses of biological values. Specific issues that should be addressed include restrictions on access, proposed land dedications, long-term monitoring and management programs, control of illegal dumping, water pollution, increased human intrusion, etc.

If burrowing owls and/or their habitat may be impacted from the project, the Department recommends that the County include specific mitigation in the DEIR. CEQA Guidelines §15126.4, subdivision (a)(1)(8) states that formulation of feasible mitigation measures should not be deferred until some future date. The Court of Appeal in *San Joaquin Raptor Rescue Center* v. *County* of *Merced* (2007) 149 Cal.App.4th 645 struck down mitigation measures which required formulating management plans developed in consultation with State and Federal wildlife agencies after Project approval. Courts have also repeatedly not supported conclusions that impacts are mitigable when essential studies, and therefore impact assessments, are incomplete *(Sundstrom* v. *County* of *Mendocino* (1988) 202 Cal. App. 3d. 296; *Gentry* v. *City* of *Murrieta (1995)* 36 Cal. App. 4th 1359; *Endangered Habitat League, Inc.* v. *County* of *Orange* (2005) 131 Cal. App. 4th 777).

The Department recommends that the DEIR specify mitigation that is roughly proportional to the level of impacts, including cumulative impacts, in accordance with the provisions of CEQA (CEQA Guidelines, §§ 15126.4(a)(4)(B), 15064, 15065, and 16355). Furthermore, in order for mitigation measures to be effective, they must be specific, enforceable, and feasible actions that will improve environmental conditions. Current scientific literature supports the conclusion that mitigation for permanent burrowing owl habitat loss necessitates replacement with an equivalent or greater habitat area for breeding, foraging, wintering, dispersal, presence of burrows, burrow surrogates, presence of fossorial mammal dens, well drained soils, and abundant and available prey within close proximity to the burrow.

4. *Habitat Revegetation/Restoration Plans*: Plans for restoration and revegetation should be prepared by persons with expertise in southern California ecosystems and native plant restoration techniques. Plans should identify the assumptions used to develop the proposed restoration strategy. Each plan should include, at a minimum: (a) the location of restoration sites and assessment of appropriate reference sites; (b) the plant species to be used, sources of local propagules, container sizes, and seeding rates; (c) a schematic depicting the mitigation area; (d) a local seed and cuttings and planting schedule; (e) a description of the irrigation methodology; (f) measures to control exotic vegetation on site; (g) specific success criteria; (h) a

detailed monitoring program; (i) contingency measures should the success criteria not be met; and (j) identification of the party responsible for meeting the success criteria and providing for conservation of the mitigation site in perpetuity. Monitoring of restoration areas should extend across a sufficient time frame to ensure that the new habitat is established, self-sustaining, and capable of surviving drought.

The Department recommends that local onsite propagules from the project area and nearby vicinity be collected and used for restoration purposes. Onsite seed collection should be initiated in the near future in order to accumulate sufficient propagule material for subsequent use in future years. Onsite vegetation mapping at the alliance and/or association level should be used to develop appropriate restoration goals and local plant palettes. Reference areas should be identified to help guide restoration efforts. Specific restoration plans should be developed for various project components as appropriate.

Restoration objectives should include protecting special habitat elements or re-creating them in areas affected by the project; examples could include retention of woody material, logs, snags, rocks, and brush piles.

5. *Nesting Birds and Migratory Bird Treaty Act:* Please note that it is the project proponent's responsibility to comply with all applicable laws related to nesting birds and birds of prey. Migratory non-game native bird species are protected by international treaty under the federal Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. 703 *et seq.*). In addition, sections 3503, 3503.5, and 3513 of the Fish and Game Code (FGC) also afford protective measures as follows: Section 3503 states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by FGC or any regulation made pursuant thereto; Section 3503.5 states that is it unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by FGC or any regulation adopted pursuant thereto; and Section 3513 states that it is unlawful to take or possess any migratory nongame bird as designated in the MBTA or any part of such migratory nongame bird except as provided by rules and regulations adopted by the Secretary of the Interior under provisions of the MBTA.

   The Department recommends that the DEIR include the results of avian surveys, as well as specific avoidance and minimization measures to ensure that impacts to nesting birds do not occur. Project-specific avoidance and minimization measures may include, but not be limited to: project phasing and timing, monitoring of project-related noise (where applicable), sound walls, and buffers, where appropriate. The DEIR should also include specific avoidance and minimization measures that will be implemented should a nest be located within the project site. If pre-construction surveys are proposed in the DEIR, the Department recommends that they be required no more than three (3) days prior to vegetation clearing or ground

disturbance activities, as instances of nesting could be missed if surveys are conducted sooner.

6. *Moving out of Harm's Way:* The proposed project is anticipated to result in the clearing of natural habitats that support native species. To avoid direct mortality, the Department recommends that the lead agency condition the DEIR to require that a Department-approved qualified biologist be retained to be onsite prior to and during all ground- and habitat-disturbing activities to move out of harm's way special status species or other wildlife of low or limited mobility that would otherwise be injured or killed from project-related activities. Movement of wildlife out of harm's way should be limited to only those individuals that would otherwise by injured or killed, and individuals should be moved only as far a necessary to ensure their safety (i.e., the Department does not recommend relocation to other areas). Furthermore it should be noted that the temporary relocation of onsite wildlife does not constitute effective mitigation for the purposes of offsetting project impacts associated with habitat loss.

7. *Translocation of Species*: The Department generally does not support the use of relocation, salvage, and/or transplantation as mitigation for impacts to rare, threatened, or endangered species as studies have shown that these efforts are experimental in nature and largely unsuccessful.

California Endangered Species Act

The Department is responsible for ensuring appropriate conservation of fish and wildlife resources including threatened, endangered, and/or candidate plant and animal species, pursuant to the California Endangered Species Act (CESA). The Department recommends that a CESA ITP be obtained if the project has the potential to result in "take" (California Fish and Game Code Section 86 defines "take" as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill") of State-listed CESA species, either through construction or over the life of the project. CESA ITPs are issued to conserve, protect, enhance, and restore State-listed CESA species and their habitats.

The Department encourages early consultation, as significant modification to the proposed project and avoidance, minimization, and mitigation measures may be necessary to obtain a CESA ITP. Please note that the proposed avoidance, minimization, and mitigation measures must be sufficient for the Department to conclude that the project's impacts are fully mitigated and the measures, when taken in aggregate, must meet the full mitigation standard. Revisions to the California Fish and Game Code, effective January 1998, require that the Department issue a separate CEQA document for the issuance of a CESA ITP unless the Project CEQA document addresses all Project impacts to listed species and specifies a mitigation monitoring and reporting program that will meet the requirements of a CESA permit.

Lake and Streambed Alteration Program

Fish and Game Code section 1602 requires an entity to notify the Department prior to commencing any activity that may do one or more of the following: Substantially divert or obstruct the natural flow of any river, stream or lake; Substantially change or use any material from the bed, channel or bank of any river, stream, or lake; or Deposit debris, waste or other materials that could pass into any river, stream or lake. Please note that "any river, stream or lake" includes those that are episodic (i.e., those that are dry for periods of time) as well as those that are perennial (i.e., those that flow year round). This includes ephemeral streams, desert washes, and watercourses with a subsurface flow. It may also apply to work undertaken within the flood plain of a body of water.

Upon receipt of a complete notification, the Department determines if the proposed project activities may substantially adversely affect existing fish and wildlife resources and whether a Lake and Streambed Alteration (LSA) Agreement is required. An LSA Agreement includes measures necessary to protect existing fish and wildlife resources. CDFW may suggest ways to modify your project that would eliminate or reduce harmful impacts to fish and wildlife resources.

The Department's issuance of an LSA Agreement is a "project" subject to CEQA (see Pub. Resources Code 21065). To facilitate issuance of an LSA Agreement, if necessary, the DEIR should fully identify the potential impacts to the lake, stream, or riparian resources, and provide adequate avoidance, mitigation, and monitoring and reporting commitments. Early consultation with the Department is recommended, since modification of the proposed project may be required to avoid or reduce impacts to fish and wildlife resources. To obtain a Lake or Streambed Alteration notification package, please go to https://www.wildlife.ca.gov/Conservation/LSA/Forms.

Additional Comments and Recommendations

California is experiencing one of the most severe droughts on record. To ameliorate the water demands of this project, the Department recommends incorporation of water-wise concepts in project landscape design plans. In particular the Department recommends xeriscaping with locally native California species, and installing water-efficient and targeted irrigation systems (such as drip irrigation). Local water agencies/districts, and resource conservation districts in your area may be able to provide information on plant nurseries that carry locally native species, and some facilities display drought-tolerant locally native species demonstration gardens (for example the Riverside-Corona Resource Conservation District in Riverside). Information on drought-tolerant landscaping and water-efficient irrigation systems is available on California's Save our Water website: http://saveourwater.com/what-you-can-do/tips/landscaping/

Further Coordination

The Department appreciates the opportunity to comment on the NOP of a DEIR for the Bloomington Business Center (SCH No. 2015121102) and recommends that County of San Bernardino address the Department's comments and concerns in the forthcoming DEIR.

If you should have any questions pertaining to the comments provided in this letter, or wish to schedule a meeting and/or site visit, please contact Edith Martinez at (909) 944-0187 or at Edith.Martinez@wildlife.ca.gov.

Sincerely,

For Leslie MacNair
Regional Manager

Literature Cited

Sawyer, J. O., T. Keeler-Wolf, and J. M. Evens. 2009. A manual of California Vegetation, 2nd ed. California Native Plant Society Press, Sacramento, California. http://vegetation.cnps.org/

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Edmund G. Brown Jr., Governor

January 18, 2016

Kevin White
San Bernardino County
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San Bernardino, CA 92415

sent via e-mail:
kevin.white@lus.sbcounty.gov

RE: SCH# 2015121102; Bloomington Business Center / JM Realty Group Project, Notice of Preparation for Draft Environmental Impact Report, San Bernardino County, California

Dear Mr. White:

The Native American Heritage Commission has received the Notice of Preparation (NOP) for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code § 21000 et seq.), specifically Public Resources Code section 21084.1, states that a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.1; Cal. Code Regs., tit.14, § 15064.5 (b) (CEQA Guidelines Section 15064.5 (b)). If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an environmental impact report (EIR) shall be prepared. (Pub. Resources Code § 21080 (d); Cal. Code Regs., tit. 14, § 15064 subd.(a)(1) (CEQA Guidelines § 15064 (a)(1)). In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources with the area of project effect (APE).

CEQA was amended significantly in 2014. Assembly Bill 52 (Gatto, Chapter 532, Statutes of 2014) (AB 52) amended CEQA to create a **separate category of cultural resources**, "tribal cultural resources" (Pub. Resources Code § 21074) and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment (Pub. Resources Code § 21084.2). Please reference California Natural Resources Agency (2016) "Final Text for tribal cultural resources update to Appendix G: Environmental Checklist Form," http://resources.ca.gov/ceqa/docs/ab52/Clean-final-AB-52-App-G-text-Submitted.pdf. Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. (Pub. Resources Code § 21084.3 (a)). **AB 52 applies to any project for which a notice of preparation or a notice of negative declaration or mitigated negative declaration is filed on or after July 1, 2015.** If your project involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space, on or after March 1, 2005, it may also be subject to Senate Bill 18 (Burton, Chapter 905, Statutes of 2004) (SB 18). **Both SB 18 and AB 52 have tribal consultation requirements**. If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (154 U.S.C. 300101, 36 C.F.R. § 800 et seq.) may also apply.

The NAHC recommends **lead agencies consult with all California Native American tribes** that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources. Below is a brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments. **Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws**.

AB 52

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

1. Fourteen Day Period to Provide Notice of Completion of an Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a **lead agency** shall provide formal notification to a designated contact of, or tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes:
    a. A brief description of the project.
    b. The lead agency contact information.
    c. Notification that the California Native American tribe has 30 days to request consultation. (Pub. Resources Code § 21080.3.1 (d)).

d. A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18). (Pub. Resources Code § 21073).

2. Begin Consultation Within 30 Days of Receiving a Tribe's Request for Consultation and Before Releasing a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report: A **lead agency** shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project. (Pub. Resources Code § 21080.3.1, subds. (d) and (e)) and prior to the release of a negative declaration, mitigated negative declaration or environmental impact report. (Pub. Resources Code § 21080.3.1(b)).
   a. For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code § 65352.4 (SB 18). (Pub. Resources Code § 21080.3.1 (b)).

3. Mandatory Topics of Consultation If Requested by a Tribe: The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:
   a. Alternatives to the project.
   b. Recommended mitigation measures.
   c. Significant effects. (Pub. Resources Code § 21080.3.2 (a)).

4. Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:
   a. Type of environmental review necessary.
   b. Significance of the tribal cultural resources.
   c. Significance of the project's impacts on tribal cultural resources.
   d. If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency. (Pub. Resources Code § 21080.3.2 (a)).

5. Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code sections 6254 (r) and 6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public. (Pub. Resources Code § 21082.3 (c)(1)).

6. Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:
   a. Whether the proposed project has a significant impact on an identified tribal cultural resource.
   b. Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code section 21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource. (Pub. Resources Code § 21082.3 (b)).

7. Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:
   a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or
   b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached. (Pub. Resources Code § 21080.3.2 (b)).

8. Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code section 21080.3.2 shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact pursuant to Public Resources Code section 21082.3, subdivision (b), paragraph 2, and shall be fully enforceable. (Pub. Resources Code § 21082.3 (a)).

9. Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation pursuant to Public Resources Code section 21084.3 (b). (Pub. Resources Code § 21082.3 (e)).

10. Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:

a. Avoidance and preservation of the resources in place, including, but not limited to:
    i. Planning and construction to avoid the resources and protect the cultural and natural context.
    ii. Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.
b. Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:
    i. Protecting the cultural character and integrity of the resource.
    ii. Protecting the traditional use of the resource.
    iii. Protecting the confidentiality of the resource.
c. Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.
d. Protecting the resource. (Pub. Resource Code § 21084.3 (b)).
e. Please note that a federally recognized California Native American tribe or a nonfederally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed. (Civ. Code § 815.3 (c)).
f. Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated. (Pub. Resources Code § 5097.991).

11. Prerequisites for Certifying an Environmental Impact Report or Adopting a Mitigated Negative Declaration or Negative Declaration with a Significant Impact on an Identified Tribal Cultural Resource: An environmental impact report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:
    a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code sections 21080.3.1 and 21080.3.2 and concluded pursuant to Public Resources Code section 21080.3.2.
    b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.
    c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code section 21080.3.1 (d) and the tribe failed to request consultation within 30 days. (Pub. Resources Code § 21082.3 (d)).

    This process should be documented in the Cultural Resources section of your environmental document.

The NAHC's PowerPoint presentation titled, "Tribal Consultation Under AB 52: Requirements and Best Practices" may be found online at: http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation_CalEPAPDF.pdf

SB 18

SB 18 applies to local governments and requires **local governments** to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. (Gov. Code § 65352.3). Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf

Some of SB 18's provisions include:

1. Tribal Consultation: If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. **A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe.** (Gov. Code § 65352.3 (a)(2)).
2. No Statutory Time Limit on SB 18 Tribal Consultation. There is no statutory time limit on SB 18 tribal consultation.
3. Confidentiality: Consistent with the guidelines developed and adopted by the Office of Planning and Research pursuant to Gov. Code section 65040.2, the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code sections 5097.9 and 5097.993 that are within the city's or county's jurisdiction. (Gov. Code § 65352.3 (b)).
4. Conclusion of SB 18 Tribal Consultation: Consultation should be concluded at the point in which:
    a. The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
    b. Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation. (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).

Agencies should be aware that neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18. For that reason,

we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File" searches from the NAHC. The request forms can be found online at: http://nahc.ca.gov/resources/forms/

NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions:

1. Contact the appropriate regional California Historical Research Information System (CHRIS) Center (http://ohp.parks.ca.gov/?page_id=1068) for an archaeological records search. The records search will determine:
   a. If part or all of the APE has been previously surveyed for cultural resources.
   b. If any known cultural resources have been already been recorded on or adjacent to the APE.
   c. If the probability is low, moderate, or high that cultural resources are located in the APE.
   d. If a survey is required to determine whether previously unrecorded cultural resources are present.

2. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
   a. The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.
   b. The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.

3. Contact the NAHC for:
   a. A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.
   b. A Native American Tribal Consultation List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.

4. Remember that the lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.
   a. Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources per Cal. Code Regs., tit. 14, section 15064.5(f) (CEQA Guidelines section 15064.5(f)). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.
   b. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.
   c. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code section 7050.5, Public Resources Code section 5097.98, and Cal. Code Regs., tit. 14, section 15064.5, subdivisions (d) and (e) (CEQA Guidelines section 15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

Please contact me if you need any additional information at gayle.totton@nahc.ca.gov.

Sincerely,

Gayle Totton, M.A., PhD.
Associate Governmental Program Analyst

cc: State Clearinghouse

SCAG
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February 10, 2017

Mr. Kevin White, Senior Planner
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RE: SCAG Comments on the Notice of Preparation of a Draft Environmental Impact Report for the Bloomington Business Center [SCAG NO. IGR9134]

Dear Mr. White,

Thank you for submitting the Notice of Preparation of a Draft Environmental Impact Report for the Bloomington Business Center ("proposed project") to the Southern California Association of Governments (SCAG) for review and comment. SCAG is the authorized regional agency for Inter-Governmental Review (IGR) of programs proposed for Federal financial assistance and direct Federal development activities, pursuant to Presidential Executive Order 12372. Additionally, SCAG reviews the Environmental Impact Reports of projects of regional significance for consistency with regional plans pursuant to the California Environmental Quality Act (CEQA) and CEQA Guidelines.

SCAG is also the designated Regional Transportation Planning Agency under state law, and is responsible for preparation of the Regional Transportation Plan (RTP) including the Sustainable Communities Strategy (SCS) pursuant to Senate Bill (SB) 375. As the clearinghouse for regionally significant projects per Executive Order 12372, SCAG reviews the consistency of local plans, projects, and programs with regional plans.[1] Guidance provided by these reviews is intended to assist local agencies such as local jurisdictions and project proponents to take actions that help contribute to the attainment of the regional goals and policies in the RTP/SCS.

SCAG staff has reviewed the Notice of Preparation of a Draft Environmental Impact Report for the Bloomington Business Center in San Bernardino County. The proposed project includes the development of a 344,000 square foot high cube warehouse facility on a 17.34 acre project site.

When available, please send environmental documentation to *SCAG's office in Los Angeles or by email to au@scag.ca.gov* providing, at a minimum, the full public comment period for review. If you have any questions regarding the attached comments, please contact the Inter-Governmental Review (IGR) Program, attn.: Anita Au, Assistant Regional Planner, at (213) 236-1874 or au@scag.ca.gov. Thank you.

Sincerely,

Ping Chang

Ping Chang
Acting Manager, Compliance and Performance Monitoring

[1] Lead agencies such as local jurisdictions have the sole discretion in determining a local project's consistency with the 2016 RTP/SCS for the purpose of determining consistency for CEQA. Any "consistency" finding by SCAG pursuant to the IGR process should not be construed as a determination of consistency with the 2016 RTP/SCS for CEQA.

COMMENTS ON THE NOTICE OF PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE BLOOMINGTON BUSINESS CENTER [SCAG NO. IGR9134]

CONSISTENCY WITH RTP/SCS

SCAG reviews environmental documents for regionally significant projects for their consistency with the adopted RTP/SCS. For the purpose of determining consistency with CEQA, lead agencies such as local jurisdictions have the sole discretion in determining a local project's consistency with the RTP/SCS.

2016 RTP/SCS GOALS

The SCAG Regional Council adopted the 2016 RTP/SCS in April 2016. The 2016 RTP/SCS seeks to improve mobility, promote sustainability, facilitate economic development and preserve the quality of life for the residents in the region. The long-range visioning plan balances future mobility and housing needs with goals for the environment, the regional economy, social equity and environmental justice, and public health (see http://scagrtpscs.net/Pages/FINAL2016RTPSCS.aspx). The goals included in the 2016 RTP/SCS may be pertinent to the proposed project. These goals are meant to provide guidance for considering the proposed project within the context of regional goals and policies. Among the relevant goals of the 2016 RTP/SCS are the following:

SCAG 2016 RTP/SCS GOALS	
RTP/SCS G1:	*Align the plan investments and policies with improving regional economic development and competitiveness*
RTP/SCS G2:	*Maximize mobility and accessibility for all people and goods in the region*
RTP/SCS G3:	*Ensure travel safety and reliability for all people and goods in the region*
RTP/SCS G4:	*Preserve and ensure a sustainable regional transportation system*
RTP/SCS G5:	*Maximize the productivity of our transportation system*
RTP/SCS G6:	*Protect the environment and health for our residents by improving air quality and encouraging active transportation (e.g., bicycling and walking)*
RTP/SCS G7:	*Actively encourage and create incentives for energy efficiency, where possible*
RTP/SCS G8:	*Encourage land use and growth patterns that facilitate transit and active transportation*
RTP/SCS G9:	*Maximize the security of the regional transportation system through improved system monitoring, rapid recovery planning, and coordination with other security agencies**
	**SCAG does not yet have an agreed-upon security performance measure.*

For ease of review, we encourage the use of a side-by-side comparison of SCAG goals with discussions of the consistency, non-consistency or non-applicability of the goals and supportive analysis in a table format. Suggested format is as follows:

SCAG 2016 RTP/SCS GOALS		
	Goal	Analysis
RTP/SCS G1:	*Align the plan investments and policies with improving regional economic development and competitiveness*	*Consistent: Statement as to why;* *Not-Consistent: Statement as to why;* *Or* *Not Applicable: Statement as to why;* *DEIR page number reference*
RTP/SCS G2:	*Maximize mobility and accessibility for all people and goods in the region*	*Consistent: Statement as to why;* *Not-Consistent: Statement as to why;* *Or* *Not Applicable: Statement as to why;* *DEIR page number reference*
etc.		etc.

2016 RTP/SCS STRATEGIES

To achieve the goals of the 2016 RTP/SCS, a wide range of land use and transportation strategies are included in the 2016 RTP/SCS. Technical appendances of the 2016 RTP/SCS provide additional supporting information in detail. To view the 2016 RTP/SCS, please visit: http://scagrtpscs.net/Pages/FINAL2016RTPSCS.aspx. The 2016 RTP/SCS builds upon the progress from the 2012 RTP/SCS and continues to focus on integrated, coordinated, and balanced planning for land use and transportation that the SCAG region strives toward a more sustainable region, while the region meets and exceeds in meeting all of applicable statutory requirements pertinent to the 2016 RTP/SCS. These strategies within the regional context are provided as guidance for lead agencies such as local jurisdictions when the proposed project is under consideration.

DEMOGRAPHICS AND GROWTH FORECASTS

Local input plays an important role in developing a reasonable growth forecast for the 2016 RTP/SCS. SCAG used a bottom-up local review and input process and engaged local jurisdictions in establishing the base geographic and socioeconomic projections including population, household and employment. At the time of this letter, the most recently adopted SCAG jurisdictional-level growth forecasts that were developed in accordance with the bottom-up local review and input process consist of the 2020, 2035, and 2040 population, households and employment forecasts. To view them, please visit http://www.scag.ca.gov/Documents/2016GrowthForecastByJurisdiction.pdf. The growth forecasts for the region and applicable jurisdictions are below.

	Adopted SCAG Region Wide Forecasts			Adopted County of San Bernardino Forecasts		
	Year 2020	Year 2035	Year 2040	Year 2020	Year 2035	Year 2040
Population	19,663,000	22,091,000	22,138,800	2,197,400	2,637,400	2,731,300
Households	6,458,000	7,325,000	7,412,300	687,100	824,600	854,300
Employment	8,414,000	9,441,000	9,871,500	789,500	998,000	1,028,100

MITIGATION MEASURES

SCAG staff recommends that you review the Final Program Environmental Impact Report (Final PEIR) for the 2016 RTP/SCS for guidance, as appropriate. SCAG's Regional Council certified the Final PEIR and adopted the associated Findings of Fact and a Statement of Overriding Considerations (FOF/SOC) and Mitigation Monitoring and Reporting Program (MMRP) on April 7, 2016 (please see: http://scagrtpscs.net/Pages/FINAL2016PEIR.aspx). The Final PEIR includes a list of project-level performance standards-based mitigation measures that may be considered for adoption and implementation by lead, responsible, or trustee agencies in the region, as applicable and feasible. Project-level mitigation measures are within responsibility, authority, and/or jurisdiction of project-implementing agency or other public agency serving as lead agency under CEQA in subsequent project- and site- specific design, CEQA review, and decision-making processes, to meet the performance standards for each of the CEQA resource categories.

South Coast
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January 20, 2017

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Notice of Preparation of a CEQA Document for the
Bloomington Business Center Project

The South Coast Air Quality Management District (SCAQMD) staff appreciates the opportunity to comment on the above-mentioned document. The SCAQMD staff's comments are recommendations regarding the analysis of potential air quality impacts from the proposed project that should be included in the Draft EIR. Please send the SCAQMD a copy of the Draft EIR upon its completion. Note that copies of the Draft EIR that are submitted to the State Clearinghouse are not forwarded to the SCAQMD. Please forward a copy of the Draft EIR directly to SCAQMD at the address in our letterhead. **In addition, please send with the Draft EIR all appendices or technical documents related to the air quality and greenhouse gas analyses and electronic versions of all air quality modeling and health risk assessment files. These include original emission calculation spreadsheets and modeling files (not Adobe PDF files). Without all files and supporting air quality documentation, the SCAQMD will be unable to complete its review of the air quality analysis in a timely manner. Any delays in providing all supporting air quality documentation will require additional time for review beyond the end of the comment period.**

Air Quality Analysis

The SCAQMD adopted its California Environmental Quality Act (CEQA) Air Quality Handbook in 1993 to assist other public agencies with the preparation of air quality analyses. The SCAQMD recommends that the lead agency use this Handbook as guidance when preparing its air quality analysis. Copies of the Handbook are available from the SCAQMD's Subscription Services Department by calling (909) 396-3720. More recent guidance developed since this Handbook was published is also available on SCAQMD's website here: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/ceqa-air-quality-handbook-(1993). SCAQMD staff also recommends that the Lead agency use the CalEEMod land use emissions software. This software has recently been updated to incorporate up-to-date state and locally approved emission factors and methodologies for estimating pollutant emissions from typical land use development. CalEEMod is the only software model maintained by the California Air Pollution Control Officers Association (CAPCOA) and replaces the now outdated URBEMIS. This model is available free of charge at: www.caleemod.com.

The lead agency should identify any potential adverse air quality impacts that could occur from all phases of the project and all air pollutant sources related to the project. Air quality impacts from both construction (including demolition, if any) and operations should be calculated. Construction-related air quality impacts typically include, but are not limited to, emissions from the use of heavy-duty equipment from grading, earth-loading/unloading, paving, architectural coatings, off-road mobile sources (e.g., heavy-duty construction equipment) and on-road mobile sources (e.g., construction worker vehicle trips, material transport trips). Operation-related air quality impacts may include, but are not limited to, emissions from stationary sources (e.g., boilers), area sources (e.g., solvents and coatings), and vehicular trips (e.g., on- and off-road tailpipe emissions and entrained dust). Air quality impacts from indirect sources, that is, sources that generate or attract vehicular trips should be included in the analysis.

The SCAQMD has also developed both regional and localized significance thresholds. The SCAQMD staff requests that the lead agency quantify criteria pollutant emissions and compare the results to the recommended regional significance thresholds found here: http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf. In addition to analyzing regional air quality impacts, the SCAQMD staff recommends calculating localized air quality impacts and comparing the results to localized significance thresholds (LSTs). LSTs can be used in addition to the recommended regional significance thresholds as a second indication of air quality impacts when preparing a Draft EIR document. Therefore, when preparing the air quality analysis for the proposed project, it is recommended that the lead agency perform a localized analysis by either using the LSTs developed by the SCAQMD or performing dispersion modeling as necessary. Guidance for performing a localized air quality analysis can be found at: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/localized-significance-thresholds.

In the event that the proposed project generates or attracts vehicular trips, especially heavy-duty diesel-fueled vehicles, it is recommended that the lead agency perform a mobile source health risk assessment. Guidance for performing a mobile source health risk assessment ("*Health Risk Assessment Guidance for Analyzing Cancer Risk from Mobile Source Diesel Idling Emissions for CEQA Air Quality Analysis*") can be found at: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/mobile-source-toxics-analysis. An analysis of all toxic air contaminant impacts due to the use of equipment potentially generating such air pollutants should also be included.

In addition, guidance on siting incompatible land uses (such as placing homes near freeways) can be found in the California Air Resources Board's *Air Quality and Land Use Handbook: A Community Perspective*, which can be found at the following internet address: http://www.arb.ca.gov/ch/handbook.pdf. CARB's Land Use Handbook is a general reference guide for evaluating and reducing air pollution impacts associated with new projects that go through the land use decision-making process.

Finally, should the proposed project include equipment that generates or controls air contaminants, a permit may be required and the SCAQMD should be listed as a responsible agency and consulted. The assumptions in the submitted Draft EIR would also be the basis for permit conditions and limits. Permit questions can be directed to the SCAQMD Permit Services staff at (909) 396-3385, who can provide further assistance.

Project Specific Comments - Proximity to SCAQMD Permitted Sources or Warehouse Sites

If the proposed project will expose future sensitive receptors to potential adverse health impacts from carcinogenic emissions generated by stationary or mobile sources, SCAQMD staff recommends that a health risk assessment be conducted to include SCAQMD permitted sources (e.g., gasoline storage and dispensing equipment, dry cleaning operations, auto-body shops with spray booth activity, etc.) emitting toxic air contaminants (TACs) within one quarter mile of the project site or all warehouse sites within 1,000 feet that includes truck activity that exceeds 100 trucks per day, or where more than 40 trucks with operating transport refrigeration units (TRUs) per day, or where TRU units exceed 300 hours per week. Risk assessment guidance resources for stationary permit and mobile sources are located at the following links on the SCAQMD website. Stationary permit sources guidance: http://www.aqmd.gov/home/permits/risk-assessment. Mobile source guidance that include diesel trucks, locomotive engines, etc., can be located at: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/mobile-source-toxics-analysis . To determine SCAQMD permitted facility equipment near the proposed project site, refer to the SCAQMD website link for the Facility INformation Detail (FIND) data base under Business Tools located at: http://www.aqmd.gov/home/tools/business .

Mitigation Measures

In the event that the project generates significant adverse air quality impacts, CEQA requires that all feasible mitigation measures that go beyond what is required by law be utilized during project construction and operation to minimize or eliminate these impacts. Pursuant to CEQA Guidelines §15126.4 (a)(1)(D), any impacts resulting from mitigation measures must also be discussed. Mitigation Measure resources are available on the SCAQMD CEQA Air Quality Handbook website: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook

Data Sources

SCAQMD rules and relevant air quality reports and data are available by calling the SCAQMD's Public Information Center at (909) 396-2039. Much of the information available through the Public Information Center is also available via the SCAQMD's webpage (http://www.aqmd.gov).

The SCAQMD staff is available to work with the lead agency to ensure that project emissions are accurately evaluated and mitigated where feasible. If you have any questions regarding this letter, please contact Gordon Mize, Air Quality Specialist by e-mail at gmize@aqmd.gov or by phone at (909) 396-3302.

Sincerely,

Jillian Wong

Jillian Wong, Ph.D.
Planning and Rules Manager
Planning, Rule Development & Area Sources

JW:GM
SBC170112-10
Control Number

Donoghue, Christine

From: Robertson, Glenn@Waterboards <Glenn.Robertson@waterboards.ca.gov>
Sent: Tuesday, February 07, 2017 1:02 PM
To: White, Kevin - LUS
Cc: Beeson, Susan@Waterboards
Subject: NOP for DEIR Bloomington Business Center/JM Realty Group

To Kevin White, Senior Planner, County of San Bernardino Land Use Services Dept. –

This is the Regional Water Quality Control Board's response to the Notice of Preparation of a Draft Environmental Impact Report (DEIR) for the proposed Bloomington Business Center Project (SCH# 2015121102), located on the southeast corner of Slover Avenue and Laurel Avenue in unincorporated Bloomington (17.34 acres). Board staff is concerned whether domestic wastewater will be sewered or if septic tanks or related systems, which have been generally utilized throughout this area, will be planned for wastewater discharge from this Project into the ground. If so, this commercial site must meet the minimum lot size requirements of the Santa Ana Region's Basin Plan for domestic wastewater systems. Industrial wastewater must be treated and discharged in a separate manner.

Please discuss this topic in the DEIR. You may obtain related information from Susan Beeson of our office at (951)782-4902. Thank you for your consideration of this comment. Glenn Robertson

Glenn S. Robertson
Engineering Geologist, M.S., PG
Regional Planning Programs Section, CEQA Coordinator
Santa Ana Regional Water Quality Control Board
3737 Main Street, Suite 500
Riverside, CA 92501
Phone: 951-782-3259
Fax: 951-781-6288
Email: Glenn.Robertson@waterboards.ca.gov

City of Rialto
California

February 8, 2017

Kevin White, Senior Planner
County of San Bernardino
Land Use Services Department – Planning Division
385 North Arrowhead Avenue, First Floor
San Bernardino, CA 92415-0187

SUBJECT: Notice of Preparation of a Draft Environmental Impact Report
Bloomington Business Center – JM Realty Group, LLC
APNs 0256-041-01, 02, 03, 47 and 48
Southeast corner of Slover Avenue and Laurel Avenue

Dear Mr. White:

Thank you for the opportunity to respond to the Notice of Preparation for the subject project that proposes a General Plan Amendment and Conditional Use Permit allowing the construction of a 344,000-square foot high cube industrial warehouse building and associated facilities and improvements. The City of Rialto, Planning Division, requests that the scope and content of the EIR include the following:

1. Aesthetics – The Initial Study does not contain the entirety of the project plans or a comprehensive project description, in particular information regarding the proposed building height, mass and bulk, finish materials and landscaping. The impacts associated with views towards distant scenic vistas, visual character of the site and its surroundings (single family residential immediately adjacent to the south), and any new sources of light or glare can't be evaluated or impact conclusions substantiated. Beyond the General Plan amendment, the construction of improvements at the site require discussion and an evaluation of any potential impacts to determine no impact, or mitigation measures, if applicable.

2. Land Use and Planning – The Initial Study discusses a Less than Significant Impact as it relates to conflicts with any applicable land use plan, policy or regulation of an agency with jurisdiction over the project. This determination acknowledges that industrial development shall generally be located on the north side of Slover Avenue based upon the County's General Plan Land Use Element, and then appears to resolve this conflict with a statement regarding the merits of the project's design elements as minimizing impacts. The EIR should contain a more comprehensive project description, including plans or exhibits to

substantiate a significant General Plan Land Use change from very low density residential to an industrial use. Further, the truck driveways do not appear to have been designed to be located away from the residential uses to the south of the project site as is summarized in this response narrative.

3. Land Use and Planning – The City of Rialto's General Plan is applicable to the project site as it is located within the City's Sphere of Influence (SOI). The narrative should be expanded to discuss the potential conflicts with the City's adopted Land Use Plan for this area as it relates to: build-out within the SOI, change in land use designation, land use policies regarding the applicability of the City's building and zoning codes to new development within the SOI, incompatibility of land uses immediately abutting (residential, high school and church development in immediate vicinity), application of the City's commercial and industrial development design criteria to the SOI, etc.

4. Transportation/Traffic – The Initial Study and TIA (dated 2015) indicates a Less than Significant impact related to the whether the project conflicts with plans or policies establishing measures of effectiveness for the performance of the circulation system, and any decrease in the performance or safety of alternative transportation modes. It is the City's understanding that the TIA will be updated in conjunction with the preparation of the DEIR. The currently available TIA indicates that the occupant of the proposed building is undetermined and that there will not be any restrictions on operating hours. The City is concerned that impacts to nearby residential and school traffic both from congestion and safety perspectives are not being adequately assessed. The City of Rialto's General Plan Circulation Element needs to be taken into consideration, particularly as it relates to anticipated interchange improvements and the distribution of truck trips. The TIA assigns truck trips westbound on Slover Avenue; however, this portion is not considered a truck route in the City's General Plan. Further, the TIA distribution of all trips from the project needs to be expanded to include the intersections leading to access to the I-10 (Slover/Cedar & Slover/Sierra) identifying associated impacts and appropriate mitigation, particularly since there is no interchange at Alder. It is not clear from the TIA or the Initial Study that the intersection improvements being proposed as mitigation for impacts at Alder and Slover, and for Linden and Slover will measurably reduce impacts.

The City looks forward to reviewing the DEIR upon its availability. Should you have any questions, please contact me via e-mail at afox@rialtoca.gov.

Sincerely,

Anne Fox
Contract Planner

cc: Gina Gibson-Williams, MPA
Planning Manager

825 East Third Street, San Bernardino, CA 92415-0835 | Phone: 909.387.8109 Fax: 909.387.7876
www.SBCounty.gov

SAN BERNARDINO COUNTY

Department of Public Works

- Flood Control
- Operations
- Solid Waste Management
- Surveyor
- Transportation

Gerry Newcombe
Director

February 9, 2017

County of San Bernardino
Land Use Service Department – Planning Division
Kevin White, Senior Planner
385 N. Arrowhead Avenue, First Floor
San Bernardino, CA. 92415-0187
kwhite@lusd.sbcounty.gov

File: 10(ENV)-4.01

RE: CEQA – NOTICE OF PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE BLOOMINGTON BUSINESS CENTER FOR THE COUNTY OF SAN BERNARDINO LAND USE SERVICES DEPARTMENT

Dear Mr. White,

Thank you for allowing the San Bernardino County Department of Public Works the opportunity to comment on the above-referenced project. **We received this request on January 12, 2017** and pursuant to our review, the following comments are provided:

General Comment

1. The project proponent shall comply with Comprehensive Storm Drain Plan No. 3-4 dated September 1997, a copy of which can be reviewed in the Flood Control Planning Division, within San Bernardino County Flood Control District (District) offices. Since there is a change in routing of drainage and since the proposed facility will be operated and maintained by the District, it should be approved by the District through the permit process. The road modifications should also be reviewed and approved by the County of San Bernardino Transportation Permits Division. If you have any questions, please contact David Lovell in the Flood Control Planning Division at 909-387-8120.

2. Any work affecting the County Maintained Road System right-of-way would need a Transportation Permit. For further information, please contact Melissa Walker in the Permits/Operations Support Division at 909-387-7995.

We respectfully request to be included on the circulation list for all project notices and reviews. In closing, I would like to thank you again for allowing the San Bernardino County Department of Public Works the opportunity to comment on the above-referenced project. Should you have any questions or need additional clarification, please contact the individuals who provided the specific comment, as listed above.

Sincerely,

Michael R. Perry
Supervising Planner
Environmental Management

Donoghue, Christine

From: Joan Schneider <JSchneider@sanmanuel-nsn.gov>
Sent: Thursday, January 26, 2017 3:09 PM
To: White, Kevin - LUS
Subject: NOP of DEIR for Bloomington Business Center APNs 0256-041 02, 03,, 47, and 48

January 26, 2017

Re: NOP of DEIR for Bloomington Business Center APNs 0256-041 02, 03,, 47, and 48, County of San Bernardino

Dear Mr. White:

Thank you for contacting the San Manuel Band of Mission Indians (SMBMI) regarding the above referenced project. SMBMI appreciates the opportunity to review the project documentation that notes the NOP, which was received by our Cultural Resources Management Department on January 12, 2017. By this e-mail, SMBMI requests to consult with the County of San Bernardino pursuant to CEQA (as amended, 2015) and CA PRC 21080.3.1. The proposed project area exists within Serrano ancestral territory and, therefore, is of interest to the Tribe. In the same manner as SMBMI consulted on the Bloomington Industrial Facility, this area is considered sensitive for cultural resources and tribal cultural resources. Would it be possible to forward to me, either by email attachment or by mail, the DEIR so that we may have it for our files and for review?

As you are aware, SMBMI will ask for a number of items to be included unless they have already been included. In addition, SMBMI respectfully requests that most of the same mitigation measures as those for the Bloomington Industrial Facility be included (of course, not looking at the Sayles/Smith house for artifacts).

As a reminder SMBMI will check for the following:

Due to the nature and location of the proposed project, SMBMI respectfully requests that:

_X__. A records search of the Sacred Lands Files managed by the CA Native American Heritage Commission and a site file and associated literature search at the appropriate California Historical Resources Information System Information Center to identify any and all recorded cultural resources within a 1-mile radius of the proposed project location(s), as well as general background research using GLO maps, Sanborn maps, historical atlases, city and state records, and other historical documents;

__X_. Additional maps/illustrations be provided, specifically including:

_X__ an aerial map;

_X__a USGS quadrangle map;

_X__a map indicating the search radius of the background research, as well as the locations where previous studies were conducted and where known historic resources are located;

_X__photographs of the proposed project area;

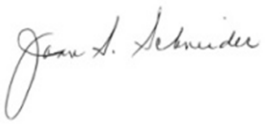
_X__engineering/design plans for the proposed project, especially plans indicating where ground-disturbing activities will occur and to what horizontal and vertical extent.

_X__. A Phase I archaeological investigation of the totality (100%) of the proposed project's area of potential effect (APE) via the employ of a number of methods, including pedestrian survey that employs a transect interval of no more than 10 meters, shovel test probes, remote sensing, and/or deep testing via controlled units or trenching of appropriate landscapes. The use of specific field methods and techniques must be justifiable and dependent upon the type and amount of ground cover present (visibility), the topographic setting (degree of slope, proximity to water, etc.), past land use (degree of prior disturbance), and probability for encountering previously undocumented resources during the proposed project (low, moderate, high probability). We strongly recommend that visibility must equal 50% or greater of the ground surface area to use pedestrian survey/reconnaissance only. Areas that have not been disturbed in the past and/or high probability areas must be explored using sub-surface testing methods in addition to pedestrian survey. Additionally, we ask that there be no collection of artifacts or excavation of features during any Phase I archaeological survey.

The provision of this information will assist San Manuel Band of Mission Indians in ascertaining whether or not the Tribe will assume consulting party status under CEQA and participate, moving forward, in project review and implementation. Please note, however, that if this information cannot be provided within the Tribe's 30-day response window, the Tribe automatically elects to be a consulting party under CEQA, as stipulated in AB52. Additionally, the CRM Department asks that the requested information be disseminated digitally via e-mail, FTP site, or some other similar technology.

Once again, the San Manuel Band of Mission Indians appreciates the opportunity to comment on this proposed project.

Respectfully,



Joan S. Schneider, PhD
San Manuel Band of Mission Indians
Cultural Resource Management Department
Consulting Archaeologist
jschneider@sanmanuel-nsn.gov
26569 Community Center Drive
Highland, CA 92346

notified that any dissemination or copying of this communication is strictly prohibited. If you have received this electronic transmission in error, please delete it from your system without copying it and notify the sender by reply e-mail so that the email address record can be corrected. Thank You

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Via Email and U.S. Mail

February 1, 2017

Kevin White, Planner
San Bernardino County
385 N. Arrow head Avenue, 1st Floor
San Bernardino, CA 92415
Kevin.White@lus.sbcounty.gov

Tom Hudson, Director
San Bernardino County - Land Use Services
385 N. Arrowhead Avenue, 1st Floor
San Bernardino, CA 92415-0187
tom.hudson@lus.sbcounty.gov

Secretary of the Planning Commission
County of San Bernardino
San Bernardino County
385 N. Arrowhead Avenue, 1st Floor
San Bernardino, CA 92415-0182

Ms. Laura H. Welch
Clerk of the Board of Supervisors
County of San Bernardino
385 N. Arrowhead Ave., 2nd floor
San Bernardino, CA 92415-0130
COB@sbcounty.gov

Re: CEQA and Land Use Notice Request for the Bloomington Business Center SCH2015121102

Dear Addressees:

I am writing on behalf of the Laborers International Union of North America, Local Union 783 and its members living in the County of San Bernardino ("LiUNA"), regarding the Bloomington Business Center aka SCH2015121102 including all actions related or referring to the development of a 344,000 sq. ft. high cube warehouse facility near the cross of Slover Ave., Laurel Ave., and Locust Ave. on APN's: 0256-041-01, -02,-03,-47, and -48. ("Project").

We hereby request that the County of San Bernardino ("County") send by electronic mail or U.S. mail to our firm at the address below notice of any and all actions or hearings related to activities undertaken, authorized, approved, permitted, licensed, or certified by the County and any of its subdivisions, and/or supported, in whole or in part, through contracts, grants, subsidies, loans or other forms of assistance from the County, including, but not limited to the following:

- Notice of any public hearing in connection with the Project as required by California Planning and Zoning Law pursuant to Government Code Section 65091.

- Any and all notices prepared for the Project pursuant to the California Environmental Quality Act ("CEQA"), including, but not limited to:

    - Notices of any public hearing held pursuant to CEQA.
    - Notices of determination that an Environmental Impact Report ("EIR") is required for a project, prepared pursuant to Public Resources Code Section 21080.4.
    - Notices of any scoping meeting held pursuant to Public Resources Code Section 21083.9.
    - Notices of preparation of an EIR or a negative declaration for a project, prepared pursuant to Public Resources Code Section 21092.
    - Notices of availability of an EIR or a negative declaration for a project, prepared pursuant to Public Resources Code Section 21152 and Section 15087 of Title 14 of the California Code of Regulations.
    - Notices of approval and/or determination to carry out a project, prepared pursuant to Public Resources Code Section 21152 or any other provision of law.
    - Notices of approval or certification of any EIR or negative declaration, prepared pursuant to Public Resources Code Section 21152 or any other provision of law.
    - Notices of determination that a project is exempt from CEQA, prepared pursuant to Public Resources Code section 21152 or any other provision of law.
    - Notice of any Final EIR prepared pursuant to CEQA.

Please note that we are requesting notices of CEQA actions and notices of any public hearings to be held under any provision of Title 7 of the California Government Code governing California Planning and Zoning Law. **This request is filed pursuant to Public Resources Code Sections 21092.2 and 21167(f), and Government Code Section 65092**, which requires agencies to mail such notices to any person who has filed a written request for them with the clerk of the agency's governing body.

Please send notice by electronic mail or U.S. mail to:

Richard Drury
Theresa Rettinghouse
Lozeau Drury LLP
410 12th Street, Suite 250
Oakland, CA 94607
510 836-4200
richard@lozeaudrury.com,
theresa@lozeaudrury.com

Please call should you have any questions. Thank you for your attention to this matter.

Sincerely,

Theresa Rettinghouse

Theresa Rettinghouse
Paralegal
Lozeau | Drury LLP

Johnson, Smith & Foy
ATTORNEYS at LAW
P.O. Box 1029, Temecula, CA 92593

Abigail A. Smith, Esq.
Kimberly Foy, Esq.
Raymond W. Johnson, Esq. *Of Counsel*

Email: Abby@socalceqa.com
Kim@socalceqa.com

Telephone: (951) 506-9925
Facsimile: (951) 506-9725

Via Email

January 26, 2017

Kevin White, Senior Planner
County of San Bernardino
Land Use Services Department – Planning Division
385 North Arrowhead Avenue, First Floor
San Bernardino, CA 92415-0187
Kevin.White@lus.sbcounty.gov

Re: ***Notice of Preparation, Bloomington Business Center- JM Realty Group, LLC, General Plan Amendment, and Conditional Use Permit (APN 0256-0410-48)***

Greetings:

On behalf of Center for Community Action and Environmental Justice, please accept these comments in strong opposition to the proposed development. As CEQA requires environmental review only for projects an agency considers for approval, we ask the County determine to deny the Project at this early stage, as it is located too close to homes, Bloomington High School, and other sensitive receptors.

If the County determines to move forward with environmental review, we first thank the County for its decision to prepare an Environmental Impact Report. Second, we ask that the environmental and human health concerns raised in our letter on the Mitigated Negative Declaration/ Initial Study, attached hereto and incorporated by reference, be fully addressed within the EIR.

Thank you very much for your consideration of these comments.

Sincerely,

Kimberly Foy
JOHNSON, SMITH & FOY

Attachment: January 18, 2016 Letter re: Draft Initial Study/Mitigated Negative Declaration

Johnson & Sedlack
ATTORNEYS at LAW

Raymond W. Johnson, Esq., AICP, LEED GA
Carl T. Sedlack, Esq., Retired
Abigail A. Smith, Esq.
Kimberly Foy, Esq.
Kendall Holbrook, Esq.

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Telephone: (951) 506-9925
Facsimile: (951) 506-9725

January 18, 2016

VIA US MAIL AND EMAIL

Kevin White
Senior Planner
County of San Bernardino
Land Use Services Department-Planning Division
385 N. Arrowhead Avenue, First Floor
San Bernardino, CA 92415-0187
kwhite@lusd.sbcounty.gov

RE: Draft Initial Study/ Mitigated Negative Declaration for Bloomington Business Center- JM Realty Group, LLC, General Plan Amendment, and Conditional Use Permit, Project No. P201400241

Greetings:

On behalf of Center for Community Action and Environmental Justice and concerned area residents, I hereby submit these comments in opposition to the Draft Initial Study/ Mitigated Negative Declaration for the Bloomington Business Center- JM Realty Group, LLC project, Project No. P201400241 (the "Project")[1].

Initially, the Notice of Availability/ Notice of Intent to Adopt an Initial Study/ Negative Declaration must be revised and the review period recommenced to allow the public and agencies to review the proposed Mitigated Negative Declaration. The Notice prepared for the Project states that the review period closes January 29, ***2014***, so that persons receiving the Notice are likely to presume the comment period has long since expired. New notice must be given and the comment period extended to ensure compliance with California Environmental Quality Act ("CEQA") Guidelines § 15072 and CEQA's procedural requirements.

Having reviewed the proposed Draft Initial Study/ Mitigated Negative Declaration, it is clear the County's proposed adoption of a Mitigated Negative Declaration for the Project fails to comply with CEQA's requirement that an Environmental Impact Report ("EIR") be prepared for any project that may result in potentially significant environmental effects. Here, the Project's use as a high-cube warehouse

[1] Please note that, in order to conserve paper, various citations herein are provided electronically and are hereby incorporated by reference. I ask that you please include the documents cited electronically in your review of this letter as if they were attached in full. If for whatever reason an electronic link does not function properly, please contact Johnson & Sedlack and I will be happy to provide you with a hard copy of the document.

facility in close proximity to homes, schools, and other sensitive receptors evidences a fair argument of impacts to air quality, health risks, noise, traffic, and safety, among other things. An EIR must be prepared.

General Comments:

Preparation of an EIR is essential to evaluate, disclose, and mitigate for the potentially significant effects of this Project. The EIR requirement is the "heart of CEQA." (State CEQA Guidelines § 15003(a).) An EIR's purpose is several. First, the document is intended to evaluate and disclose the environmental consequences of a project to inform the public and decision-makers of its true environmental consequences. Second, the EIR is to consider and evaluate mitigation and alternatives to avoid significant environmental impacts. If feasible, these mitigation measures must be adopted. If infeasible, the project may be approved in spite of its significant impacts with a statement of the overriding considerations that justify its approval. In any event, decision makers will make a rational decision based upon the true environmental consequences of the project and if they do not, the electorate can hold them accountable for their decisions via CEQA's information disclosure requirements.

Because an EIR is the heart of CEQA, it is required for any proposed project for which there is a fair argument that it *may* have a *potentially* significant effect on the environment. (Public Resources Code § 21100 (a).) Only where it is clear no significant effects may occur can this requirement be properly circumvented. Applicable here, a lead agency may prepare a Mitigated Negative Declaration ("MND") for a proposed project *only* when: (1) revisions in the project would avoid or mitigate the potentially significant project effects to a point where *clearly* no significant effects would occur; and (2) there is *no* substantial evidence in light of the whole record that the project as revised *may* have a significant effect on the environment. (State CEQA Guidelines § 15070 (b))

The adoption of a MND for the Project is improper here as significant environmental impacts are likely to result from the Project which are not adequately addressed in the Draft Initial Study/ Mitigated Negative Declaration ("IS/MND") and which require preparation of an EIR. Specifically, the Project may result in significant impacts to/from, at least, air quality/health risks, traffic, greenhouse gas emissions, noise, agricultural resources, hydrology/water quality, noise, utilities, and regional and cumulative impacts.

Additionally, the conclusions in the IS/MND are unacceptably conclusory and not based on substantial evidence. Under CEQA it is the duty of the agency, not the public, to investigate and evaluate a project's environmental consequences. An "agency should not be allowed to hide behind its own failure to gather relevant data." (*Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 311.) Despite this admonition, the IS/MND is void of any evaluation, inquiry, data, or other evidence showing the Project will have no significant environmental effects. While the IS/MND sometimes references alleged studies, none are included with the document or properly incorporated by reference. The IS/MND fails to comply with the County's investigative and information disclosure duties.

The potentially significant impacts of this Project are also not shown to be mitigated below a level of significance. Moreover, CEQA requires that, if mitigation is adopted for a project, all proposed mitigation measures are fully enforceable and certain to occur. The mitigation proposed with this Project is vague, uncertain, and unenforceable and improperly deferred.

Project Description

The Project site comprises 17.43 acres located on Slover Avenue between Laurel Avenue and Locust Avenue. The site presently consists of five parcels: four vacant parcels and one with a single-family residence. Surrounding uses include warehousing and single-family residences to the north, single-family residences adjacent to the site to the south, a church and single-family residences to the east, and industrial and single-family residences to the west. Bloomington High School is located on Laurel Avenue to the southwest of the site, with school uses about 600 feet from the proposed Project (and its entrance approximately 1,200 feet to the south). The IS/MND fails to list this use.

The Project includes (1) a General Plan Amendment to change the land use zoning district from Bloomington/ Single Residential with a 20,000 minimum lot size, additional agricultural overlay (BL/R-20M-AA) and from Bloomington/ Single Residential with a one acre minimum lot size, additional agricultural overlay (BL/RS-1-AA), to Bloomington/Community Industrial; and (2) a Conditional Use Permit to develop a 344,000 square foot high-cube warehouse facility on the site. The proposed warehouse development includes truck and passenger vehicle parking, fencing, gates, and vegetation. The warehouse appears to propose approximately 50 dock doors and over 200 vehicle parking stalls, though this information is not disclosed in the IS/MND project details.

Aesthetics

There is absolutely no substantial evidence in the IS/MND to support the claim that impacts to aesthetics will be no impact or less than significant. Where the Project would develop adjacent to existing homes to the south, potential aesthetic impacts may occur from shadowing the adjacent properties or subjecting them to displeasing fencing, landscaping, or wall treatments. As no information is provided concerning what "aesthetic enhancements" would occur, there is no evidence aesthetic effects would be less than significant. No mitigation is required for this potentially significant effect.

The Project would also create a new significant source of light in the area according to the IS/MND. The IS/MND, however, claims this impact will be less than significant through compliance with the Glare and Outdoor Lighting requirements and shielding. Again, however, given the Project's close proximity to existing residences, there is no evidence shielding will be sufficient to reduce impacts below significance. This is particularly true where no information is provided about Project lighting. Will the Project operate 24/7? What type of lighting will be used? Where will lighting be located? Again, no mitigation is required for this potentially significant effect.

Agricultural and Forestry Resources

The IS/ MND proposes to find the Project will have no impact on agricultural resources. This finding is not supported by evidence.

First, the Project requires a General Plan Amendment to change the land use zoning district from Bloomington/ Single Residential with a 20,000 minimum lot size, with additional agriculture overlay (BL/R-20M-AA) and from Bloomington/ Single Residential with a one acre minimum lot size, with additional agriculture overlay (BL/RS-1-AA), to Bloomington/Community Industrial. According to the San Bernardino County Development Code, the purposes of the Additional Agriculture overlay is to "create, preserve, and improve areas for small-scale and medium-scale agricultural uses utilizing

productive agricultural lands for raising, some processing, and the sale of plant crops, animals, or their primary products. It is an overlay where agricultural uses exist compatibly with a variety of rural residential lifestyles." (Development Code § 82.07.010) The IS/MND fails to evaluate or disclose if the site is or has recently been in productive agricultural use. The IS/MND also fails to consider the the effects of the conversion of this Additional Agriculture overlay land to non-agricultural use.

Second, the Additional Agriculture overlay may be applied where, "where it will serve to protect and enhance an area that is a neighborhood or community substantially occupied by rural-type single dwellings on large parcels, and predominantly used for small-scale commercial agricultural activities." (Development Code § 82.07.020) The IS/ MND fails to consider whether the Project would have adverse impacts to surrounding agricultural uses in the neighborhood or community. Impacts to off-site agricultural use may be significant.

Third, the IS/MND also fails to consider the indirect, secondary, and cumulative impacts of the Project on the conversion of agricultural land to non-agricultural use in this area, where Prime, Unique, and Farmland of Statewide Importance still exists to the southeast of the Project site off Locust Avenue according to the State's Important Farmland Finder map, available at <http://maps.conservation.ca.gov/ciff/ciff.html>. These impacts may be significant.

Fourth, the Project may result in significant agricultural impacts by failing to comply with the General plan Goal V/LU 1, "Provide opportunities, where possible, for a rural lifestyle that preserves the unique character within suitable locations of the Valley Region." The Project would convert such suitable land designated Additional Agriculture to non-agricultural uses.

Air Quality

The IS/MND states the information contained in the Air Quality section is based in part on an analysis prepared by LSA Associates. No such analysis is included with the IS/MND, nor is it incorporated by reference with a location where it may be reviewed. Reliance on such a study is consequently improper.

(a) With respect to the first threshold of whether the Project may conflict with the AQMP, the IS/MND cites the conclusions of the LSA Associates Air Quality Analysis that a less than significant impact would result would occur without reference to the reasoning of the Analysis, the modeled emissions of the Project or thresholds applied, or any other information. The mere conclusion is insufficient and fails to evidence the County actually investigated this potential impact.

(b and c) No site-specific or Project-specific information is provided in the IS/MND regarding construction impacts. For example, how long is construction anticipated to last? How much grading is anticipated to be necessary? Any need to import or export fill at the site? How many daily vehicle trips to and from the site during Project construction? A two-row chart listing the "peak daily" construction emissions in comparison to the SCAQMD threshold is unsupported by substantial evidence without the underlying facts, assumptions, data, and reasoning.

Cumulative construction air quality impacts are also not considered with, for instance, the Bloomington Truck Terminal Project, Planning Case Number P201300121.

The IS/MND states the "traffic impact analysis" estimates the Project would generate 758 daily trips. The IS/MND does not attach or incorporate this analysis. The anticipated vehicle mix with Project operation is not disclosed. How many of the Project's daily trips would be truck trips? Did the operational air quality analysis distinguished between the heavy-duty trucks and passenger vehicles in its projections with a reasonable vehicle mix based on ITE trip rates and fleet mixes? Again, no modeling or underlying assumptions are provided regarding potential operational impacts, instead just a brief conclusory chart. Absent the data and reasoning based on fact and data, this chart is insufficient to support the finding that impacts will be less than significant during Project operation.

Cumulative operational air quality impacts are not evaluated, disclosed, or mitigated.

The IS/MND does not show construction or operational air quality impacts will be less than significant with the incorporation of mitigation. The following mitigation measures should be required of the Project after adequate evaluation of Project effects:

CONSTRUCTION

1. Gravel pads must be installed at all access points to prevent tracking of mud onto public roads.
2. Install and maintain trackout control devices in effective condition at all access points where paved and unpaved access or travel routes intersect (eg. Install wheel shakers, wheel washers, and limit site access.)
3. All roadways, driveways, sidewalks, etc., should be completed as soon as possible. In addition, building pads should be laid as soon as possible after grading unless seeding or soil binders are used.
4. Pave all construction roads.
5. Pave all construction access roads at least 100 feet on to the site from the main road.
6. The maximum vehicle speed on unpaved roads shall be 15 mph.
7. Limit fugitive dust sources to 20 percent opacity.
8. When materials are transported off-site, all material shall be covered, effectively wetted to limit visible dust emissions, and at least six inches of freeboard space from the top of the container shall be maintained.
9. All streets shall be swept at least once a day using SCAQMD Rule 1186 certified street sweepers utilizing reclaimed water trucks if visible soil materials are carried to adjacent streets.
10. The contractor or builder shall designate a person or persons to monitor the dust control program and to order increased watering, as necessary, to prevent transport of dust offsite.
11. Post a publicly visible sign with the telephone number and person to contact regarding dust complaints. This person shall respond and take corrective action within 24 hours.
12. Extend grading period sufficiently to reduce air quality impacts below a level of significance.
13. The simultaneous disturbance of the site shall be limited to five acres per day.
14. Adequate watering techniques shall be employed to mitigate the impact of construction-related dust particulates. Portions of the site that are undergoing surface earth moving operations shall be watered such that a crust will be formed on the ground surface, and then watered again at the end of each day. Site watering shall be performed as necessary to adequately mitigate blowing dust.

15. Any vegetative cover to be utilized onsite shall be planted as soon as possible to reduce the disturbed area subject to wind erosion. Irrigation systems required for these plants shall be installed as soon as possible to maintain good ground cover and to minimize wind erosion of the soil.
16. Apply non-toxic soil stabilizers according to manufactures' specifications to all inactive construction areas (previously graded areas inactive for ten days or more).
17. Any site access points within 30 minutes of any visible dirt deposition on any public roadway shall be swept or washed.
18. Excavating and grading operations shall be suspended during first stage ozone episodes or when winds exceed 25 mph as instantaneous gusts. A high wind response plan shall be formulated for enhanced dust control if winds are forecast to exceed 25 mph in any upcoming 24-hour period.
19. Prohibit truck idling in excess of five minutes both on- and off-site.
20. Implement activity management techniques including a) development of a comprehensive construction management plan designed to minimize the number of large construction equipment operating during any given time period; b) scheduling of construction truck trips during non-peak hours to reduce peak hour emissions; c) limitation of the length of construction work-day period; and d) phasing of construction activities.*
21. Develop a trip reduction plan to achieve a 1.5 AVR for construction employees.*
22. Require high pressure injectors on diesel construction equipment.*
23. Restrict truck operation to "clean" trucks, such as a 2007 or newer model year or 2010 compliant vehicles.*
24. All diesel powered construction equipment in use shall require control equipment that meets, at a minimum Tier IV emission requirements. In the event Tier IV equipment is not available, diesel powered construction equipment in use shall require emissions control equipment with minimum of Tier III diesel standards.*
25. Require the use of CARB certified particulate traps that meet level 3 requirements on all construction equipment.*
26. Utilize only CARB certified equipment for construction activities.*
27. The developer shall require all contractors to turn off all construction equipment and delivery vehicles when not in use and/or idling in excess of 3 minutes.*
28. Restrict engine size of construction equipment to the minimum practical size.*
29. Use electric construction equipment where technically feasible.*
30. Substitute gasoline-powered for diesel-powered construction equipment.*
31. Require use of alternatively fueled construction equipment, using, e.g., compressed natural gas, liquefied natural gas, propane, or biodiesel.*
32. Use methanol-fueled pile drivers.*
33. Use electricity from power poles rather than temporary diesel or gasoline power generators.*
34. Require the use of Alternative Diesel Fuels on diesel equipment used. Alternative diesel fuels exist that achieve PM10 and NOx reductions.
35. Electrical powered equipment shall be utilized in-lieu of gasoline-powered engines where technically feasible.*
36. All forklifts shall be electric or natural gas powered.*
37. Any construction equipment using direct internal combustion engines shall use a diesel fuel with a maximum of 0.05 percent sulfur and a four-degree retard.*
38. Demonstrate proper inspection and maintenance of construction equipment.*

39. Employ a construction site manager to verify that engines are properly maintained and keep a maintenance log.*
40. Consolidate truck deliveries when possible.*
41. Establish a staging zone for trucks that are waiting to load or unload material at the work zone in a location where diesel emissions from the trucks will have minimum impact on abutters and the general public.
42. Locate construction equipment away from sensitive receptors including, fresh air intakes to buildings, air conditioners and operable windows.
43. Require all diesel trucks used by construction contractors at the site, or for on-road hauling of construction material, to be post-2007 models or 2010 compliant vehicles.
44. Diesel portable generators shall not be allowed at the construction site.
45. Use to the extent technologically feasible hybrid and fuel efficient construction equipment and support vehicles. (e.g. pick up trucks.)*
46. Use a Heavy-Duty Off-Road Vehicle Plan to ensure compliance with construction mitigation measures, incorporating the use of at least hourly meters on equipment; documentation of the serial number, horsepower, manufacturing age, fuel, etc. of all onsite equipment; and daily logging the operating hours of equipment.
47. All off-road diesel-powered construction equipment greater than 50 hp shall meet Tier 3 off-road emissions standards. In addition, all construction equipment shall be outfitted with BACT devices certified by CARB. Any emissions control device used by the contractor shall achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similarly sized engine as defined by CARB regulations.
48. By January 1, 2015, all off-road diesel-powered construction equipment greater than 50 hp shall meet Tier 4 emissions standards, where available. In addition, all construction equipment shall be outfitted with BACT devices certified by CARB. Any emissions control device used by the contractor shall achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similarly sized engine as defined by CARB regulations.
49. A copy of each unit's certified tier specification, BACT documentation, and CARB or AQMD operating permit shall be provided at the time of mobilization of each applicable unit of equipment.
50. During Project construction, the applicant will be required to solicit bids that include use of energy and fuel efficient fleets.*
51. During Project construction, the applicant will be required to solicit preference construction bids that use BACT, particularly those seeking to deploy zero- and/or near zero emission technologies.*
52. During Project construction, the applicant will be required to use the minimum feasible amount of GHG emitting construction materials that is feasible.*
53. During Project construction, the applicant will be required to use cement blended with the maximum feasible amount of flash or other materials that reduce GHG emissions from cement production to the extent feasible.*
54. Require preparation of a traffic control plan.*
55. Provide temporary traffic controls such as a flag person, during all phases of construction to maintain smooth traffic flow.*
56. Provide dedicated turn lanes for movement of construction trucks and equipment on- and off-site.*

57. Reroute construction trucks away from congested streets and sensitive receptor areas.*
58. Configure construction parking to minimize traffic interference.*
59. Prior to the issuance of a grading and building permit, the applicant shall submit verification that a ridesharing program for the construction crew has been encouraged and will be supported by the contractor via incentives or other inducements.*
60. Implement a carpool program for construction workers.*
61. Minimize construction worker trips by requiring carpooling and providing for lunch onsite. *
62. Provide shuttle service to transit stations/multimodal centers for the construction crew.*
63. Develop a Low-impact Construction Commuting Plan for all tradespersons to utilize during Project construction. This Plan shall address the home to office/shop commute and office/shop to jobsite commute and increase carpooling and other commuting efficiencies during construction.*

OPERATIONAL EMISSIONS

1. All fleet vehicles and all heavy duty trucks entering the property must meet or exceed 2010 air quality emissions standards, specified in Cal. Code of Regulations Title 13, Art. 4.5, Chapter 1, Section 2025. Results, including backup data shall be reported to the Planning Department semi-annually.*
2. (ALTERNATIVELY from 1 above) The operator of the primary facilities shall incorporate requirements or incentives sufficient to achieve at least 20% per year (as a percentage of previous percentage, not total trips) increase in percentage of long haul trips carried by 2010 compliant trucks carriers until it reaches a minimum of 90% of all long haul trips carried by 2010 compliant trucks. Results, including backup data shall be reported to the Planning Department semi-annually.*
3. The operator of the primary facilities shall become SmartWay Partner.*
4. The Project shall meet SmartWay 1.25 ratings.*
5. The Project shall use only freight companies that meet SmartWay 1.25 ratings.*
6. (ALTERNATIVELY from 4, 5 above) The operator of the primary facilities shall incorporate requirements or incentives sufficient to achieve at least 20% per year (as a percentage of previous percentage, not total trips) increase in percentage of long haul trips carried by SmartWay carriers until it reaches a minimum of 90% of all long haul trips carried by SmartWay 1.0 or greater carriers. Results, including backup data shall be reported to the Planning Department semi-annually.*
7. All spaces utilizing refrigerated storage, including restaurants and food or beverage stores, shall provide an electrical hookup for refrigeration units on delivery trucks. Trucks incapable of utilizing the electrical hookup for powering refrigeration units shall be prohibited from accessing the site. All leasing documents shall include these requirements and provide that violation of those provisions will constitute a material breach of the lease that will result in the termination of the lease. Because of the fact that these terms of the lease are designed to benefit the public, the public shall be considered to be a third party beneficiary with standing to enforce the requirements of the lease.*
8. Install catalytic converters on gasoline-powered equipment.*
9. Where diesel powered vehicles are necessary, require the use of alternative diesel fuels. Alternative diesel fuels exist that achieve PM10 and NOx reductions. Electrical powered equipment should be utilized in-lieu of gasoline-powered engines where technically feasible.*
10. Utilize electrical equipment for landscape maintenance.*

11. All forklifts shall be electric or natural gas powered.*
12. Utilize electric yard trucks, yard goats, and hostlers. Prohibit the use of diesel powered yard trucks, yard goats, and hostlers.*
13. Prohibit idling of trucks for periods exceeding three minutes both on warehouse property and on nearby streets.*
14. Provide electrical vehicle ("EV") and compressed natural gas ("CNG") vehicles in vehicle fleets.*
15. Charge reduced or no parking fee for EVs and CNG vehicles.*
16. Install EV charging facilities for a minimum of 10% of all parking spaces.*
17. Install a CNG fueling facility.*
18. Provide preferential parking locations for EVs and CNG vehicles.*
19. Implement parking fee for single-occupancy vehicle commuters.*
20. Plant shade trees in parking lots to provide minimum 50% cover to reduce evaporative emissions from parked vehicles.*
21. Plant at least 50 percent low-ozone forming potential (Low-OFP) trees and shrubs, preferably native, drought-resistant species, to meet city/county landscaping requirements.*
22. Plant Low-OFP, native, drought-resistant, tree and shrub species, 20% in excess of that already required by city or county ordinance. Consider roadside, sidewalk, and driveway shading.*
23. Orient 75 percent or more of homes and buildings to face either north or south (within 30 degrees of N/S) and plant trees and shrubs that shed their leaves in winter nearer to these structures to maximize shade to the building during the summer and allow sunlight to strike the building during the winter months.*
24. Provide grass paving, tree shading, or reflective surface for unshaded parking lot areas, driveways, or fire lanes that reduce standard black asphalt paving by 10% or more.*
25. Prohibit gas powered landscape maintenance equipment within residential, commercial, and mixed-use developments. Require landscape maintenance companies to use battery powered or electric equipment **or** contract only with commercial landscapers who operate with equipment that complies with the most recent California Air Resources Board certification standards, or standards adopted no more than three years prior to date of use or any combination of these two themes.*
26. Implement parking cash-out program for non-driving employees.*
27. Require each user to establish a carpool/vanpool program.*
28. Provide preferential parking for carpool/vanpool vehicles.*
29. Provide subsidies or incentives to employees who use public transit or carpooling, including preferential parking.*
30. Provide secure, weather-protected bicycle parking for employees.*
31. Provide direct, safe, attractive pedestrian access from project to transit stops and adjacent development.*
32. Provide direct safe, direct bicycle access to adjacent bicycle routes.*
33. Provide showers and lockers for employees bicycling or walking to work.*
34. Connect bicycle lanes/paths to city-wide network.*
35. Design and locate buildings to facilitate transit access, e.g., locate building entrances near transit stops, eliminate building setbacks, etc.*
36. Construct transit facilities such as bus turnouts/bus bulbs, benches, shelters, etc.*
37. Provide a display case or kiosk displaying transportation information in a prominent area accessible to employees.
38. Provide shuttle service to food service establishments/commercial areas.*

39. Provide shuttle service to transit stations/multimodal centers.*
40. All buildings shall be constructed to LEED Gold standards.*
41. Buildings shall exceed Title 24 requirements by 20%.*
42. Design buildings for passive heating and cooling and natural light, including building orientation, proper orientation and placement of windows, overhangs, skylights, etc.*
43. Construct photovoltaic solar or alternative renewable energy sources sufficient to provide 100% of all electrical usage for the entire Project.*
44. Install an ozone destruction catalyst on all air conditioning systems.*
45. Construct renewable energy sources sufficient to offset the equivalent of 100% of all greenhouse gas emissions from mobile sources (internal combustion engines) for the entire Project. *
46. Purchase only green/ renewable power from the electric company.*
47. Install solar water heating systems to generate all hot water requirements.*
48. Require all on-site vehicles to use zero or near-zero emission technology.*
49. Require the installation of sufficient alternative fueling infrastructure such as electric charging, CNG/LNG, hydrogen, etc.; for all trucks on-site and/or within close proximity to the site. Employ these technologies and phase-in further use. (e.g. 10% by 2015, 20% by 2020, etc.)*
50. Provide a phase-in schedule and goals for the introduction of zero or near zero emission technology trucks that visit the site, beginning with 10% upon completion of construction and increasing to at least 20% within 5 years, etc.*
51. The facility operator shall maintain a log of all trucks entering the facility to ensure that, on average, the daily truck fleet meets the quantities and emissions disclosed in the MND. The facility operator shall, on average, ensure that trucks entering the facility are limited to the quantity disclosed in the MND. The log of trucks shall be available for inspection by County Staff at any time.*
52. If higher truck volumes are anticipated to visit the site than analyzed in the MND, the operator shall seek, and the lead agency shall commit to, re-evaluate the additional impacts through CEQA prior to determining to allow or disallow this higher activity level.
53. The facility operator shall ensure that onsite staff in charge of keeping a daily log and monitoring for excess idling be trained and certified in diesel health effects and technologies. (For example, by requiring attendance at CARB approved courses.)
54. Limit project operations to non-refrigerated warehouse types of trucks and appurtenances.
55. Require tenants upon occupancy that do not already operate 2007 and newer trucks to apply in good faith for funding to replace/retrofit their trucks such as Carl Moyer, Prop 1B, VIP, HVIP, and SOON funding programs, as identified on SCAQMD's website (http://www.aqmd.gov). Should funds be awarded, the tenant shall be required to accept and use them.
56. Restrict overnight parking in residential areas. Establish overnight parking within the warehouse/distribution center where trucks can remain overnight.
57. Establish areas within the facility for truck repairs to ensure well-maintained vehicles and reduce travel for repairs.
58. For all warehouse uses of the proposed Project, the loading docks shall be designed to accommodate SmartWay trucks. For example, the aerodynamic equipment for trailers may include use of "Boat Tails" that attach to the end of the trailer and may potentially be incompatible with loading bays designed with certain dock shelters. (http://www.epa.gov/smartway/technology/designated-tractors-trailers.htm) Proof of compliance shall be provided in building plans prior to the issuance of building permits and subject to on-site verification prior to occupancy.*

59. The Project is required to reduce waste by 15 percent through a waste diversion program that requires recycling and composting from some or all uses on the Project site. This will be required by the County prior to issuances of building permits.*
60. All Project buildings must be constructed to allow for easy, cost-effective installation of solar energy systems in the future, using such "solar-ready" features as: Clear access without obstructions (chimneys, heating and plumbing vents, etc.) on the south sloped roof; Designing the roof framing to support the addition of solar panels; and Installation of electrical conduit to accept solar electric system wiring.*
61. Prior to the issuance of a certificate of occupancy, the applicant shall provide the developer/ operator with information regarding energy efficiency, solid waste reduction, recycling, motor vehicle-related greenhouse gas emissions, and water conservation best practices. The applicant shall also publicize information regarding solid waste reduction and recycling best practices to developers and tenants. Finally, the applicant shall encourage the use of alternative transportation methods among its tenants, including bus transit, vanpools, carpools, and car- and ridesharing programs.

(d) Health risk impacts are inadequately evaluated. The IS/MND concludes the Project would not expose sensitive receptors to substantial pollutant concentrations. This contention is unsupported by evidence or reasoning. The IS/MND acknowledges diesel exhaust contains hazardous air pollutants but fails to consider the Project's operational impacts to adjacent sensitive receptors. Where the Project proposes high-cube warehousing which would generate truck trips adjacent to sensitive receptors and approximately 600 feet from a high school, the health risk impacts from diesel exhaust are potentially significant.

Locating the proposed Project at this site also fails to comply with the County General Plan and Land Use Policy LU 8.1, which states, "Potentially polluting, hazardous, and other health risk facilities should be located no closer than one-quarter mile to a sensitive receptor and vice versa." Also, LU 8.2, "Review development proposals to minimize impacts, such as air emissions, on sensitive receptors."

SCAQMD generally recommends preparation of a health risk assessment which evaluates 15 minutes of truck idling onsite to account for idling/stacking upon entry/exit, as well as at idling at dock doors and parking. (*See e.g.* Letter from SCAQMD to City of San Bernardino Re: Draft Environmental Impact Report (Draft EIR) for the Proposed National Orange Show Industrial Project <http://www.aqmd.gov/ceqa/igr/2012/February/DEIRorangeshow.pdf> p. 4 paragraph 7.) Off-site, vehicle routes should be considered and grid-type modeling completed to determine if the Project may result in individually and cumulatively significant health risk impacts to sensitive receptors at nearby residences, churches, and Bloomington High School.

There is presently no evidence cumulative health risk impacts would be less than significant. Where *existing* health risk impacts in the Project area are estimated up to 906 cancers per million according to SCAQMD's MATES III study, well above healthful levels, an accurate health risk assessment that discloses potential impacts to the public and decision-makers is absolutely essential. (MATES III Interactive Map, http://www3.aqmd.gov/webappl/matesiii/) The IS/MND fails to provide the public and decision-makers with needed information and an accurate assessment of the Project's individual and cumulative health risk impacts.

Diesel PM is known to cause immune system effects; reproductive, developmental, and endocrine effects; nervous system effects; and lung health problems, as recognized by the County in the General Plan. Additional electronic citations to this effect are attached at the end of this document and incorporated by reference. Immune system effects include increased allergic inflammatory responses and suppression of infection fighting ability. Diesel PM has also been associated with reproductive effects such as decreased sperm production, changes in fetal development, low birth weight and other impacts. Diesel PM exposure may also cause impairment to the central nervous system. (*The Health Effects of Air Pollution on Children*, Michael T. Kleinman, Ph.D, Fall 2000, <http://aqmd.gov/forstudents/health_effects_on_children.html#WhyChildren>; *See also, Diesel and Health in America: the Lingering Threat*, Clean Air Task Force, February 2005, <http://www.catf.us/resources/publications/files/Diesel_Health_in_America.pdf>)

With regards to respiratory and cancer effects of diesel PM, SCAQMD has stated the following:

"Diesel particles consist mainly of elemental carbon and other carbon-containing compounds… Diesel particles are microscopic…Due to their minute size, diesel particles can penetrate deeply into the lung. There is evidence that once in the lung, diesel particles may stay there for a long time.

In addition to particles, diesel exhaust contains several gaseous compounds including carbon monoxide, nitrogen oxides, sulfur dioxide and organic vapors, for example formaldehyde and 1,3-butadiene. Formaldehyde and 1,3-butadiene have been classified as toxic and hazardous air pollutants. Both have been shown to cause tumors in animal studies and there is evidence that exposure to high levels of 1,3-butadiene can cause cancer in humans…

Diesel emissions may also be a problem for asthmatics. Some studies suggest that children with asthma who live near roadways with high amounts of diesel truck traffic have more asthma attacks and use more asthma medication.

Some human volunteers, exposed to diesel exhaust in carefully controlled laboratory studies, reported symptoms such as eye and throat irritation, coughing, phlegm production, difficulty breathing, headache, lightheadedness, nausea and perception of unpleasant odors. Another laboratory study, in which volunteers were exposed to relatively high levels of diesel particles for about an hour, showed that such exposures could cause lung inflammation." (*The Health Effects of Air Pollution on Children, supra*; *See also, Mira Loma Commerce Center EIR No. 450, Air Quality, Section 4.*)

Furthermore, infants, children, and the elderly are more susceptible to diesel PM and its associated health impacts. With regards to infants and children, increased susceptibility to TACs and diesel PM exists for a variety of reasons. Children are generally more active than adults, have higher respiration rates, and inhale more pollutants deeper into the lung. Children also have more lung surface area in proportion to their body size and inhale more air pound for pound when compared to adults, taking in 20 to 50 percent more air and associated air pollutants than adults. When compared to adults, children spend more active time outdoors in polluted air environments and exert themselves harder than adults when playing outside. Importantly, this exposure to high pollutant levels in children occurs while their lungs are still developing, and therefore has more severe impacts on this sensitive group. (*The Health Effects of Air Pollution on Children, supra*.) Proximity to a school thus worsens health risk effects.

This increased susceptibility to air pollutant emissions for children has resulted in the California EPA Office of Environmental Health Hazard Assessment ("OEHHA") weighting cancer risk by a factor of 10 for exposures to carcinogens from birth to two years old, and by a factor of 3 for exposures from 2 years old to 15 years old. (*Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values, and adjustments to allow for early life stage exposures*, California EPA OEHHA Air Toxicology and Epidemiology Branch, April 2009, p. 3. <http://www.oehha.ca.gov/air/hot_spots/pdf/TSDCPFApril_09.pdf.>) Additionally, recent studies conducted by SCAQMD's Brain and Lung Tumor and Air Pollution Foundation have found a specific connection between exposure to diesel PM and brain cancer in children. (Annual Meeting of the Brain & Lung Tumor and Air Pollution Foundation, April 2, 2010, <http://www.aqmd.gov/hb/2010/April/100425a.htm>)

In addition to an increased risk of cancer, the effects of diesel PM on children include slowed lung function and growth, increased emergency room visits, increased incidences of asthma and bronchitis, crib death, asthma respiratory infections, allergic symptoms, and asthma hospitalizations. (*Diesel and Health in America: the Lingering Threat*, *supra*.) An accurate projection of health risks is thus particularly necessary here where the Project is located in close proximity to Bloomington High School and many residences.

The following mitigation measures should be incorporated to reduce the health risk impacts of the Project:

1. The Project applicant shall fund the purchase, installation and maintenance of in-home air filtration systems for residential and church parcels impacted by the Project (once a HRA is prepared) at a total cost of at least $1,700 per parcel. The air filtrations systems shall be selected by the owners of each parcel in consultation with SCAQMD.
2. The Project applicant shall fund the purchase, installation and maintenance of an air filtration system for Bloomington High School or contribute funds for this purpose.
3. Landscaping must be enhanced to provide a vegetative buffer zone along the southern eastern, and western Project boundaries. Trees that reduce diesel particulate matter shall be planted in this buffer zone, examples of which include California Pepper Trees and Bottlebrush Trees. Sycamore trees may also be planted along with drought tolerant plants.
4. Create a buffer zone of at least 250 feet between warehouse/distribution center and sensitive receptors. Prohibit the placement of loading docks and truck routes within this area.
5. Design the Project so that any check-in point for trucks is well inside the facility property to ensure that no trucks queue outside of the facility.
6. Avoid locating Project entry/ exit points and driveways near closest residences and other sensitive receptors.
7. Design the Project so that interior vehicular circulation shall be located away from sensitive receptors. Require the Project clearly specify on the facility site primary entrance and exit points.
8. Require the Project establish specific truck routes and post signs between the Project and the freeway/primary access arterial that achieves that objective and eliminate trucks from traversing residential areas. Entry and exit points should be limited to Slover Avenue.
9. Require signage identifying where food, lodging, and entertainment can be found when not available onsite.

10. Require the installation of electric hook-ups to eliminate idling of main and auxiliary engines during loading, unloading, and when trucks are not in use.
11. Restrict idling within the facility to less than 3 minutes. Post signs within the facility stating that no idling in excess of 3 minutes is permitted.
12. Install clean fueling stations at the Project site.
13. Provide pamphlets to all truck drivers about the health effects of diesel particulates, the benefits of minimizing idling time, CARB regulations, and the importance of not parking in residential areas.
14. Require the posting of signs outside the facility providing a phone number which neighbors may call if there is an air quality issue. Require response to such calls within 24 hours.

Biological Resources

The IS/MND states the Project is located in a Biological Resources Overlay for Burrowing Owl, and that a focused survey was prepared for the Burrowing Owl with field work occurring between May 2, 2015 and June 18, 2015. This survey is not included with the IS/MND or properly incorporated by reference. There is no substantial evidence supporting the conclusion less than significant impacts would occur. In any event, even if the Burrowing Owl was not observed in the nesting season survey, a pre-construction survey is needed to ensure no Burrowing Owl have relocated to the site.

The IS/MND also fails to consider impacts to migratory birds and raptors. Mitigation measures should be adopted to ensure impacts to these species do not occur. These measures should include, at a minimum, preconstruction nesting surveys and avoidance of any active nests on or around the Project site.

Cultural Resources

The IS/ MND states the Project will not impact archaeological or paleontological resources as "no resources have been identified on the site." There is no information provided as to what actions have been taken to identify such resources at the site. Were any databases reviewed? Do the geologic features which underlie the site have a high, moderate, or low potential for paleontological resources?

Tribal resources are said to have been evaluated in a Cultural Resources Assessment. This Assessment is not included with the IS/MND or properly incorporated by reference.

Geology and Soils

No preliminary geotechnical appears to have been prepared for the Project, although threshold (d) refers to a Geotechnical Investigation. Where is this investigation? How was it conducted? What was found?

Greenhouse Gas Emissions

The IS/MND states the Project garnered 102 points on the County's screening tables for project-specific emissions. These tables have not been provided with the IS/MND, so this conclusory statement is unsupported by substantial evidence. Which reduction measures will be incorporated into this Project? What is more, it is not certain any of these measures will be incorporated in the Project where no mitigation or condition of approval is currently provided which ensures consistency with the points

claimed actually occurs with Project development. This impact should thus be considered potentially significant and mitigation adopted to ensure the Project actually reduces GHG emissions below significant levels.

In addition, the County's GHG reduction plan only extends to 2020. The Governor recently issued an executive order, Executive Order B-30-15, which instituted a new interim reduction target of 40 percent below 1990 levels by 2030. Compliance with the County's GHG Plan thus fails to show the Project will not have a significant impact where the Project will almost assuredly be operational after 2020. The Supreme Court in *Center for Biological Diversity v. California Department of Fish & Wildlife* (Newhall Land) (Opinion Filed Nov. 30, 2015) noted projects would need to start considering project effects on these longer-term emissions reduction targets. (Sup. Ct. Opinion No. S217763, available at http://www.courts.ca.gov/opinions/documents/S217763.PDF, p. 17 and fn. 6)

Hazards and Hazardous Materials

The IS/MND states the Project would not emit hazardous emissions within one-quarter mile of a school because "the project does not propose the use of hazardous materials." (IS/MND p. 27) This conclusion ignores hazardous diesel emissions from the Project's construction and operation near Bloomington High School. The Project may result in significant impacts under this threshold.

Hydrology/ Water Quality

No information is provided in the IS/MND about the runoff flows pre- and post- development. It is not shown with certainty that the Project will reduce flows and treat storm water sufficiently to have a less than significant impact.

The IS/MND concludes, "The proposed development will decrease all flow events from their predevelopment conditions for flow and volume." This statement has no basis in fact, modeling, or other opinion. Where the Project proposes to pave an over 16-acre site, the contention the Project would not substantially alter the drainage pattern onsite is patently false absent evidence to the contrary.

The IS/MND relies on a SWPPP and WQMP to reduce impacts to hydrology and water quality, yet neither is required mitigation for this Project. Absent the certain, enforceable implementation these plans, impacts should be deemed potentially significant.

Noise

Preparation of an EIR is needed to quantify, disclose, and mitigate the noise impacts of this Project to the extent feasible. The IS/MND fails to disclose noise standards; evaluate or take measurements of existing noise; model anticipated Project noise during construction and operation; etc. Noise impacts will likely be significant. Numerous studies concerning the effects of noise and detailing noise levels anticipated with various activities are attached to this letter, and should be reviewed with these comments.

With respect to threshold (a), while the IS/MND is accurate truck parking and dock doors are on Slover Ave., other vehicle parking is located adjacent to residences and may cause noise impacts when car doors are closed, people are talking, etc. In addition, driveways are presently located off of Slover

Ave, and noise may occur at these on-site driveways. Off-site traffic noise impacts may also result and are not considered in the IS/MND. There is also no evidence 300 feet is sufficient to reduce truck noise below County standards. Cumulative noise impacts are also omitted from consideration. The IS/MND likewise fails to consider whether Project construction noise will exceed County standards. The IS/MND does not demonstrate to a certainty that potentially significant noise impacts will be insignificant.

At threshold (b), no information is provided about the scope of short term vibration impacts, and nothing shows such impacts which are acknowledged to potentially occur will be reduced *below significance* with mitigation. Reduction to the "greatest extent practicable" is not necessarily to less than significant levels.

Threshold (c) provides no information concerning existing ambient noise levels compared to anticipated noise with the Project. There is not fact or reasoning for the conclusion noise would be less than significant where no consideration is even made of impacts from on- and off-site sources pursuant to this threshold. As vehicles generate traffic noise which may increase the ambient noise in the area; and trucks, vehicles, people, and other activities will generate on-site noise, this impact is potentially significant. An EIR must be prepared to evaluate this impact.

Likewise threshold (d) makes no comparison of existing ambient noise levels and anticipated Project-caused construction noise as required by the threshold question. This threshold does not ask whether the Project will comply with the County's Development Code regarding construction. There is no evidence the potentially significant construction noise impacts will be reduced below significance with the incorporation of Mitigation Measure N-1. Again, reduction to the "greatest extent practical" is not necessarily to less than significant levels.

Additional mitigation is available to reduce construction noise impacts and should be required of the Project, including:

1. During construction, install construction noise barriers with a minimum STC rating of 20 around the site. An example of an acceptable barrier would be fencing covered with a quilted blanket (STC rating of 27).

2. Where technically feasible, utilize only electrical construction equipment

3. During construction, the developer shall require that all contractors turn off all construction equipment and delivery vehicles when not in use and prohibit idling in excess of 3 minutes.

4. Locate any stockpiles, materials, and construction equipment at the furthest distance possible from sensitive receptors.

The following mitigation is available to reduce operational noise impacts from the Project, once such noise is evaluated and needed reductions determine.

1. Provide upgraded windows with a minimum Sound Transmission Class (STC) rating of 34 for all buildings, and/or require the installation of double-paned windows for residences impacted by the Project.

2. Keep new driveways away from noise sensitive receptors. Siting all driveways on Slover Ave. is preferable.

3. Require the use of rubberized asphalt for construction of all roadways and parking areas.

4. Maintain quality pavement conditions that are free of bumps, pot holes, pavement cracks, differential settlement in bridge approaches or individual pavement slabs, etc.

5. Require resurfacing of roads adjacent to the Project or to be used by the Project.

Traffic/ Transportation

The IS/MND states at threshold (a) that the Project will require improvements to Slover Ave., Laurel Ave., and Locust Ave.. At threshold (b), the IS/MND states improvements at Alder/Slover and Linden/ Slover are also needed. There is no evaluation of the impacts of this off-site construction including impacts to noise, traffic, air quality, etc. Noise impacts may be significant at sensitive receptors adjacent to street construction. Likewise traffic impacts may be significant to, for instance, school traffic if the road improvements occur during the school year. These construction impacts must be evaluated and mitigated in an EIR.

The IS/MND states truck access will be on Slover Ave. with passenger trips on Locust and Laurel Aves. There is no explanation of how such trips will be confined, or mitigation measure adopted enforce these driveway restrictions. Curb cuts and other circulation engineering should be required to ensure trucks cannot and do not use the Locust and Laurel driveways.

Threshold (a) asks if the Project conflicts with applicable plan, ordinance, or policy establishing levels of effectiveness for performance of the circulation system. There is no consideration of whether the Project complies with the General Plan policies relative to circulation.

With respect to threshold question (b), the IS/MND states a traffic study was prepared by Translutions in May 2014. This study is not provided with the IS/MND nor properly incorporated by reference. The IS/MND is impermissibly conclusory without disclosure of these underlying facts, intersections and roadways included in any study, modeling, assumptions, etc.

There is no evidence that intersection improvements will reduce impacts are Alder/Slover and Linden/Slover below a level of significance. As the IS/MND acknowledges impacts at these intersections may be significant, an MND is improper absent such evidence.

The IS/MND states the payment of fair share fees will mitigate for cumulative project impacts at various intersections. Such mitigation does not show impacts will be reduced below a level of significance absent showing the improvements are planned and will be timely implemented to serve Project needs. There is also no evident consideration of impacts to roadway segments and capacities.

Impacts to the I-10 mainline and its on- and off-ramps from the Project and cumulatively are not considered in the IS/MND. Where the Project will generate some 758 daily PCE trips according to the IS/MND and is located just a block south of I-10, there is evidence of potentially significant and unmitigated impacts to this freeway. Traffic impacts to state highway facilities will likely remain significant and unavoidable as a result of delays in Caltrans' improvements and/or no alternative mechanism by which mitigation fees are paid in lieu of directly improving these state highway facilities.

There is no evidence of the fleet mix considered in the traffic study or how PCE and peak trip estimates were generated. Any traffic study should be prepared using SCAQMD's recommended truck trip rates based on ITE rates for high cube warehouse projects. (*See*, http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/high-cube-warehouse)

There is no consideration of cumulative traffic impacts in the near term (existing and opening year). Where other projects are being developed in the vicinity and may contribute to the traffic impact of this Project, including e.g. the Bloomington Truck Terminal Project on the north side of Slover Ave. west of Linden Ave., their cumulative effects must be considered. There is evidence cumulative impacts may be significant.

Construction traffic impacts from vehicle trips are also not evaluated or mitigated. As construction traffic impacts may be significant, the following mitigation measures must be incorporated:

1. Provide temporary traffic controls such as a flag person, during all phases of construction to maintain smooth traffic flow.
2. Provide dedicated turn lanes for movement of construction trucks and equipment on- and off-site.
3. Reroute construction trucks away from congested streets and sensitive receptor areas.
4. Configure construction parking to minimize traffic interference.
5. Prior to the issuance of a grading and building permit, the applicant shall submit verification that a ridesharing program for the construction crew has been encouraged and will be supported by the contractor via incentives or other inducements.
6. Minimize construction worker trips by requiring carpooling and providing for lunch onsite.
7. Provide shuttle service to food service establishments/commercial areas for the construction crew.
8. Provide shuttle service to transit stations/multimodal centers for the construction crew.
9. Improve traffic flow by signal synchronization.
10. Work with Caltrans to ensure adequate LOS at impacted on- and off- ramps.

Mitigation for operational impacts may include several of the measures detailed within the air quality section of this letter, such as ride sharing programs. Other mitigation may include road improvement requirements; however, given the absence of needed information in the MND, the necessary requirements are uncertain.

Regarding threshold (d), the IS/MND states the Project would not increase hazards from incompatible uses, "because there are no incompatible uses proposed by the project that would impact surrounding land uses." (IS/MND p. 43) In fact, the Project would generate heavy duty truck trips in close proximity to residences, a church, and a high school, potentially creating a transportation hazard due to such incompatibility. As discussed above, this is inconsistent with the County's General Plan

policies LU 8.1 which states "Potentially polluting, hazardous, and other health risk facilities should be located no closer than one-quarter mile to a sensitive receptor and vice versa."

Mitigation Measure T-1 states a revised traffic study was prepared February 20, 2015 This revised study is also not included with the IS/MND or properly incorporated by reference. Mitigation Measure T-1 is also uncertain and unenforceable where the fair share payments are not actually listed or incorporated in the mitigation measure. What fair-share percentages will be paid? In addition, mitigation via fair share contribution is not shown to adequately mitigate this newly identified effect below a level of significance, as discussed above, absent evidence it is planned to be timely implemented.

In all, the analysis of this Project's potential traffic impacts is inadequate and impacts are not shown to be mitigated below a level of significance. Further evidence of potentially significant impacts exists. An EIR must be prepared for the Project.

Utilities and Service Systems

The determinations that the Project would not result in significant impacts to utilities and service systems is conclusory and unsupported by any evidence included with the IS/MND. For example, there is no evidence or reasoning showing the existing on-site septic system is sufficient to serve the project. Furthermore, the County's General Plan seeks to have all new development connect to sewer where reasonably available or within 1 mile from existing sewer. (General Plan LU 9.5, *also,* CI 12.4, 12.10). The Project may have significant impacts by its proposed reliance on septic in contravention of this sewer requirement.

There is also no evidence West Valley Water District has determined there will be adequate water to serve the Project, and no water supply assessment was prepared for the Project. Mitigation measures are available and should be implemented to reduce Project water supply needs and adverse impacts, including:

1. Use only recycled water for landscaping purposes. Require installation of a recycled water line to the Project.

2. Utilize low water intensive turf or artificial turf. Minimize the use of turf/ artificial turf to recreational areas.

3. Install only ultra-low-flow plumbing fixtures in all buildings.

4. Install only dual flush toilets, which allow users to choose a larger or smaller flush as needed.

5. Require drip irrigation for landscaping where technically feasible.

6. Require mulching or equivalent organic ground cover to reduce water needs for all landscaped areas.

Cumulative Impacts

The cumulative impact assessment for this Project is non-existent. The IS/MND fails to evaluate the effects with this Project and *any* surrounding projects that may increase or compound this Project's environmental effects. At a minimum the cumulative impacts of this Project and the Bloomington Truck

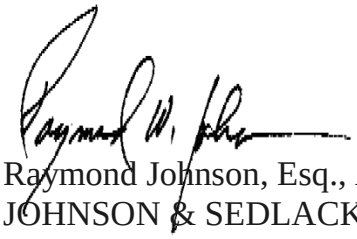
Terminal Project must be considered. Cumulative effects of the Project are potentially significant for at least traffic, air quality/ health risks, hazards, noise, utilities, and GHGs, among others. An EIR is essential to adequately consider such impacts.

Conclusion

For the reasons detailed herein, an EIR must be prepared to evaluate, disclose, and mitigate for the potentially significant environmental effects of this Project.

Thank you for your consideration of these comments and the attached material.

Sincerely,



Raymond Johnson, Esq., AICP, LEED Green Associate
JOHNSON & SEDLACK

Additional Electronic Citations

(1) *Warehouse Truck Trip Study Data Results and Usage*, SCAQMD Mobile Source Committee, July 25, 2014.< http://www.aqmd.gov/docs/default-source/ceqa/handbook/high-cube-warehouse-trip-rate-study-for-air-quality-analysis/finaltrucktripstudymsc072514.pdf?sfvrsn=2 >

(2) *The Health Effects of Air Pollution on Children*, Michael T. Kleinman, Ph.D, Fall 2000, < http://www.aqmd.gov/docs/default-source/students/health-effects.pdf?sfvrsn=0 >

(3) *Diesel and Health in America: the Lingering Threat*, Clean Air Task Force, February 2005, < http://www.catf.us/resources/publications/files/Diesel_Health_in_America.pdf >

(4) "AQMD Guidance Document for Addressing Air Quality Issues in General Plans and Local Planning," < http://www.aqmd.gov/docs/default-source/planning/air-quality-guidance/complete-guidance-document.pdf?sfvrsn=4 >, May 6, 2005. Also available for download by chapter at < http://www.aqmd.gov/home/library/documents-support-material/planning-guidance/guidance-document >

(5) U.S. Department of Transportation, Federal Highway Administration. (August 2006) *Construction Noise Handbook, Chapters 3, 4, and 9* < http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/index.cfm >

(6) Electronic Library of Construction Occupational Safety and Health (November/December 2002) *Construction Noise: Exposure, Effects, and the Potential for Remediation; A Review and Analysis.* < http://www.elcosh.org/document/1434/d000054/Construction%2BNoise%253A%2BExposure%252C%2BEffects%252C%2Band%2Bthe%2BPotential%2Bfor%2BRemediation%253B%2BA%2BReview%2Band%2BAnalysis.html?show_text=1 >

(7) U.S. Department of Housing and Urban Development. (March 2009) *The Noise Guidebook.* < https://www.onecpd.info/resource/313/hud-noise-guidebook/ >

(8) Suter, Dr. Alice H., Administrative Conference of the United States. (November 1991) *Noise and Its Effects*. <http://www.nonoise.org/library/suter/suter.htm >

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Temecula, CA 92590
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Johnson & Sedlack, an Environmental Law firm representing plaintiff environmental groups in environmental law litigation, primarily CEQA.

City Planning:

Current Planning

- Two years principal planner, Lenexa, Kansas (consulting)
- Two and one half years principal planner, Lee's Summit, Missouri
- One year North Desert Regional Team, San Bernardino County
- Thirty years subdivision design: residential, commercial and industrial
- Thirty years as applicants representative in various jurisdictions in: Missouri, Texas, Florida, Georgia, Illinois, Wisconsin, Kansas and California
- Twelve years as applicants representative in the telecommunications field

General Plan

- Developed a policy oriented Comprehensive Plan for the City of Lenexa, Kansas.
- Updated Comprehensive Plan for the City of Lee's Summit, Missouri.
- Created innovative zoning ordinance for Lenexa, Kansas.
- Developed Draft Hillside Development Standards, San Bernardino County, CA.
- Developed Draft Grading Standards, San Bernardino County.
- Developed Draft Fiscal Impact Analysis, San Bernardino County

Environmental Analysis

- Two years, Environmental Team, San Bernardino County
  - Review and supervision of preparation of EIR's and joint EIR/EIS's
  - Preparation of Negative Declarations
  - Environmental review of proposed projects
- Eighteen years as an environmental consultant reviewing environmental documentation for plaintiffs in CEQA and NEPA litigation

Representation:

- Represented various clients in litigation primarily in the fields of Environmental and Election law. Clients include:
    - Sierra Club
    - San Bernardino Valley Audubon Society
    - Sea & Sage Audubon Society
    - San Bernardino County Audubon Society
    - Center for Community Action and Environmental Justice
    - Endangered Habitats League
    - Rural Canyons Conservation Fund
    - California Native Plant Society
    - California Oak Foundation
    - Citizens for Responsible Growth in San Marcos
    - Union for a River Greenbelt Environment
    - Citizens to Enforce CEQA
    - Friends of Riverside's Hills
    - De Luz 2000
    - Save Walker Basin
    - Elsinore Murrieta Anza Resource Conservation District

Education:

- B. A. Economics and Political Science, Kansas State University 1970
- Masters of Community and Regional Planning, Kansas State University, 1974
- Additional graduate studies in Economics at the University of Missouri at Kansas City
- J.D. University of La Verne. 1997 Member, Law Review, Deans List, Class Valedictorian, Member Law Review, Published, Journal of Juvenile Law

Professional Associations:

- Member, American Planning Association
- Member, American Institute of Certified Planners
- Member, Association of Environmental Professionals
- Member, U.S. Green Building Council, LEED GA

Johnson & Sedlack, Attorneys at Law
26785 Camino Seco 12/97- Present
Temecula, CA 92590
(951) 506-9925

Principal in the environmental law firm of Johnson & Sedlack. Primary areas of practice are environmental and election law. Have provided representation to the Sierra Club, Audubon Society, AT&T Wireless, Endangered Habitats League, Center for Community Action and Environmental Justice, California Native Plant Society and numerous local environmental groups. Primary practice is writ of mandate under the California Environmental Quality Act.

Planning-Environmental Solutions
26785 Camino Seco 8/94- Present
Temecula, CA 92590
(909) 506-9825

Served as applicant's representative for planning issues to the telecommunications industry. Secured government entitlements for cell sites. Provided applicant's representative services to private developers of residential projects. Provided design services for private residential development projects. Provided project management of all technical consultants on private developments including traffic, geotechnical, survey, engineering, environmental, hydrogeological, hydrologic, landscape architectural, golf course design and fire consultants.

San Bernardino County Planning Department
Environmental Team 6/91-8/94
385 N. Arrowhead
San Bernardino, CA 92415
(909) 387-4099

Responsible for coordination of production of EIR's and joint EIR/EIS's for numerous projects in the county. Prepared environmental documents for numerous projects within the county. Prepared environmental determinations and environmental review for projects within the county.

San Bernardino County Planning Department
General Plan Team 6/91-6/92
385 N. Arrowhead
San Bernardino, CA 92415
(909) 387-4099

Created draft grading ordinance, hillside development standards, water efficient landscaping ordinance, multi-family development standards, revised planned development section and fiscal impact analysis. Completed land use plans and general plan amendment for approximately 250 square miles. Prepared proposal for specific plan for the Oak Hills community.

San Bernardino County Planning Department
North Desert Regional Planning Team
15505 Civic 6/90-6/91
Victorville, CA

(619) 243-8245

Worked on regional team. Reviewed general plan amendments, tentative tracts, parcel maps and conditional use permits. Prepared CEQA documents for projects.

Broadmoor Associates/Johnson Consulting
229 NW Blue Parkway
Lee's Summit, MO 64063
(816) 525-6640 2/86-6/90

Sold and leased commercial and industrial properties. Designed and developed an executive office park and an industrial park in Lee's Summit, Mo. Designed two additional industrial parks and residential subdivisions. Prepared study to determine target industries for the industrial parks. Prepared applications for tax increment financing district and grants under Economic Development Action Grant program. Prepared input/output analysis of proposed race track Provided conceptual design of 800 acre mixed use development.

Shepherd Realty Co.
Lee's Summit, MO 6/84-2-86

Sold and leased commercial and industrial properties. Performed investment analysis on properties. Provided planning consulting in subdivision design and rezoning.

Contemporary Concepts Inc.
Lee's Summit, MO 9/78-5/84
Owner

Designed and developed residential subdivision in Lee's Summit, Mo. Supervised all construction trades involved in the development process and the building of homes.

Environmental Design Association
Lee's Summit, Mo.
Project Coordinator 6/77-9/78

Was responsible for site design and preliminary building design for retirement villages in Missouri, Texas and Florida. Was responsible for preparing feasibility studies of possible conversion projects. Was in charge of working with local governments on zoning issues and any problems that might arise with projects. Coordinated work of local architects on projects. Worked with marketing staff regarding design changes needed or contemplated.

City of Lee's Summit, MO
220 SW Main
Lee's Summit, MO 64063
Community Development Director 4/75-6/77

Supervised Community Development Dept. staff. Responsible for preparation of departmental

budget and C.D.B.G. budget. Administered Community Development Block Grant program. Developed initial Downtown redevelopment plan with funding from block grant funds. Served as a member of the Lee's Summit Economic Development Committee and provided staff support to them. Prepared study of available industrial sites within the City of Lee's Summit. In charge of all planning and zoning matters for the city including comprehensive plan.

Howard Needles Tammen & Bergendoff
9200 Ward Parkway
Kansas City, MO 64114
(816) 333-4800 5/73-4/75
Economist/Planner

Responsible for conducting economic and planning studies for Public and private sector clients. Consulting City Planner for Lenexa, KS.

Conducted environmental impact study on maintaining varying channel depth of the Columbia River including an input/output analysis. Environmental impact studies of dredging the Mississippi River. Worked on the Johnson County Industrial Airport industrial park master plan including a study on the demand for industrial land and the development of target industries based upon location analysis. Worked on various airport master plans. Developed policy oriented comprehensive plan for the City of Lenexa, KS. Developed innovative zoning ordinance heavily dependent upon performance standards for the City of Lenexa, KS.

CCAEJ

Center for Community Action and Environmental Justice

Centro de Acción Comunitaria y Justicia Ambiental

Penny Newman
Executive Director

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Jurupa Valley, CA
92509

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Jurupa Valley, CA
92519

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Email: admin@ccaej.org
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Kevin White, Senior Planner
County of San Bernardino
Land Use Services Department—Planning Division
385 North Arrowhead Avenue, First Floor
San Bernardino, CA 92415-0187

Su: Notice of Preparation of a Draft Environmental Impact Report (EIR)

Dear Mr. White: February 6th, 2017

The Center for Community Action and Environmental Justice (CCAEJ) is a non-profit organization serving the Riverside and San Bernardino County. We know the communities which we serve experience significant exposure to diesel emissions and other toxic air pollution, causing many health problems including cancer, asthma, cardiovascular disease, low birth weight and premature babies. Currently, communities within the Inland region are overburdened with industrial facilities that diminish the quality of life by producing loud and constant noise, heavy lighting at night, industrial blight, and public safety risks. These negative impacts must be assessed in an Environmental Impact Report per the environmental protections of the California Environmental Quality Act.

Multiple studies demonstrate that our Inland Valley communities are already overburdened with exposure to diesel pollution and negative public health effects. For these reasons, we oppose the Bloomington Business Center Project; this project would negatively impact and exacerbate public health and safety of our already vulnerable communities. We use the findings of the California Environmental Protection Agency (CalEPA) CalEnviroScreen where it identifies the area of Bloomington in the pollution burden of 100 percentile. This screen is accessible online at http://oehha.ca.gov/ej/ces2.html

Your leadership in protecting Bloomington resident's and nearby communities' health, safety and quality of life is critical. Responsible industry projects, such as warehouse proposals, should not cause further harm to environmental justice communities. Again, CCAEJ urges you to not support the Bloomington Business Center Project in the corner of Laurel and Slover Ave.

Respectfully,
Ericka Flores
Community Organizer

Center for Community Action and Environmental Justice

Across our country and throughout the world, people struggle to ensure that the air they breathe, the water they drink, and the land they share, is safe, healthy and protected. For more than 35 years, CCAEJ has provided the support and leadership to communities in this struggle. We are a nonprofit organization dedicated to improving both our social conditions and the natural environment we inhabit so that everyone has a safe, healthy, toxic free place to live, work, learn, and play.

These are your children!

This is your community!

This is your life!

Get Involved—Make a Difference!

Join your neighbors and fight back.

Westside Community Action Team meets at Ruben Campos Community Center 4-6:00.

Call for next meeting date.

Ericka Flores at 951-360-8451

C · C · A · E · J

Center for Community Action and Environmental Justice

Centro de Acción Comunitaria y Justicia Ambiental

PO Box 33124
Jurupa Valley, CA 92519

Phone: 951-360-8451
Fax: 951-360-5950
E-mail:penny.n@ccaej.org

Loma Linda Health Study Results

CCAEJ

BNSF Railyard:

A Public Health Crisis

Findings: Health Study of Westside Residents living near BNSF Railyard

In 2008, the California Air Resources Board (CARB) released the results of Health Risk Assessment conducted at major railyards in California. The results found that out of all the railyards, the San Bernardino BNSF Intermodal facility posed the greatest community health risk. As startling as it was it was an estimate based on modeling not real health cases. Loma Linda University School of Public Health researchers were asked to conduct a health study to see what the actual impact the railyard was having on the health and well being of local families. These are the findings.

The study consisted of 3 components—

1. Cancer Assessment;
2. Adult Household-level Study; and
3. Children's Respiratory Health

The adult household study interviewed 1,075 people in the winter/spring of 2012. The study included a survey, two respiratory tests and indoor and outdoor air sampling. It compared an Exposed area (A & B); a high exposure area Zone A, closest to the railyard; Zone B, moderate Exposure area; and a background area not in the railyard impact area

While findings were borderline significant ..."a consistent trend of increased prevalence of adverse outcomes was observed from the Moderate to the High exposure regions. Across endpoints and exposure levels, elevations ranged from small to moderate."

Demographic information was equally alarming.

83.90% Hispanic
60% make less than $10,000 per year
75.39% under age 40
60% do not have health insurance and do not use the emergency room.

Loma Linda Research Findings

Cancer Study

For all cancers

- **23%** elevation for white males and a 10% overall elevation.

Breast Cancer:

- **30 %** elevation among Hispanic Females

Lung/bronchus cancer:

- **78%** excess among females in the high risk are (residents closest to the railyard)
- **34%** elevated level for white females and 37% increase in white males throughout study area

Colon/rectal cancer:

- **44%** increase among males

Pancreatic Cancer:

- **43%** elevation for both sexes

Children's Respiratory Health Study

1,066 (74% participation) in two schools Exposure School (ES) (Ramona Alessandro Elementary School near the railyard and a control school (CS) in Fontana, 7 miles from the area and away from the railyard, but still in a highly polluted area near busy traffic corridors.

Conducted two lung function tests (PEF—lung function indicator) and FENO (a marker for airway inflammation) as well as measurements of height and weight.

- **47%** of ES children demonstrated **asthma** or asthma like symptoms
- ES children experienced a significant **59% increase** in the prevalence of reduced PEF compared to the CS children.
- **70%** of parents did not know their children had asthma.

Project ENRRICH: A Public Health Assessment of Residential Proximity to a Goods Movement Railyard

Project ENRRICH: A Public Health Assessment of Residential Proximity to a Goods Movement Railyard

The BP/South Coast Air Quality Management District (AQMD) Public Benefits Oversight Committee

RESPONSE TO RFP:
Community Benefit Programs Addressing Conditions Caused or Exacerbated by Air Pollution

TITLE OF ORIGINAL APPLICATION:
Responding to a Community's Call for Action: Studying the Health Effects of an Intermodal Railyard in San Bernardino

PRINCIPAL INVESTIGATORS:
Sam Soret, PhD, MPH
Associate Dean for Public Health Practice, Office of Public Health Practice; and Executive Director, Center for Community Resilience
Loma Linda University School of Public Health

Susanne Montgomery, PhD, MPH
Professor of Social Work and Social Policy, and Director of Research
Behavioral Health Institute, Loma Linda University School of Behavioral Health

FINAL REPORT

ORGANIZATION:
Loma Linda University
24888 Prospect Avenue
Loma Linda, California, 92354

LOMA LINDA UNIVERSITY

LOMA LINDA UNIVERSITY AUTHORS:
Sam Soret
Susanne Montgomery
Rhonda Spencer-Hwang

DISCLAIMER:

Scientists from Loma Linda University developed this report for the *BP/South Coast Air Quality Management District (AQMD) Public Benefits Oversight Committee* as a basis for further scientific evaluation and technical discussion. Regulatory action cannot be construed from this report, nor does it have the force or effect of regulation. This report's contents are solely the responsibility of the grantee and do not necessarily represent the official views of the South Coast Air Quality Management District or BP.

This report presents a public health assessment which focused on gathering baseline information on community conditions and on specific health outcomes in the populations residing near a goods movement railyard facility in the City of San Bernardino, California. Causality in the exposure-outcome associations that were evaluated cannot be established given the cross-sectional study design. The information contained in this report is intended for use in the formulation of mitigation strategies and in guiding additional research efforts. However, whether and how this report should be used in potential mitigation and/or policy processes is outside the purview and responsibility of the authors and of Loma Linda University.

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Thank You to Our Funders and Partners

The Environmental Railyard Research Impacting Community Health (ENRRICH) Project is a collaborative effort involving several entities. In this report, we acknowledge the following agencies, organizations, and individuals for their contributions to the development and implementation of Project ENRRICH:

- The BP/South Coast Air Quality Management District (AQMD) Public Benefits Oversight Committee funded the study under LLC grant # 659005.
- Dr. Susanne Montgomery received partial support from the Loma Linda University Center for Health Disparities under NIH grant 1P20MD006988.
- The Center for Community Advocacy and Environmental Justice (CCAEJ) and the Director, Ms. Penny Newman, provided invaluable support as true partners throughout the study.
- Dr. John Morgan, Regional Epidemiologist for the Desert Sierra Cancer Surveillance Program (Region 5 of the California Cancer Registry) and Professor of Epidemiology at LLU School of Public Health, conducted the population-based cancer assessment and contributed to Chapter 3.
- Our LLU team of epidemiologists and statisticians provided expertise, input, and technical guidance in the design and analytical phases of the study: Rhonda Spencer-Hwang, Synnove Knutsen, David Shavlik, Larry Beeson, and Mark Ghamsary.
- Dr. Xinqiu Zhang, South Coast Air Quality Management District, provided emissions data from the Multiple Air Toxics Exposure Study (MATES).
- The San Bernardino City Unified School District (SBCUSD) and the Fontana Unified School District (FUSD) and their respective Education Boards approved and facilitated the school-based health assessments. We are grateful to Mr. Danny Tillman, member of the Board of Education at SBCUSD, and Dr. Barbara Flores, past Board President at SBCUSD, for their support and leadership.
- Principals Luis Chavez-Andere (SBCUSD) and Joel Avina-Sanchez (FUSD) and their respective faculty provided incredible support through the planning and implementation of the schoolchildren's respiratory health screenings.
- The Arrowhead Regional Center Breathmobile® collaborated with Project ENRRICH in the respiratory health screening activities.
- The Aerocrine Corporation contributed technical assistance during the respiratory health screenings and donated additional F_{ENO} (airway inflammation) tests to offer screenings to all children at both schools.
- Past San Bernardino Mayor Patrick Morris, County Supervisor Josie Gonzalez, San Bernardino Councilmember Virginia Marquez, and Dr. Maxwell Ohikhuare, San Bernardino County Health Officer, for their vision and leadership.
- Dr. David Dyjack, past Dean, LLU SPH, and Dr. Patricia Penniecook, current Dean, LLU SPH, were instrumental in the establishment of Project ENRRICH and made resources available throughout this project, including partial support for Drs. Soret and Spencer.
- Dr. Richard Hart, Loma Linda University President, was instrumental in enabling the partnership between the City of San Bernardino and Loma Linda University, which led to the establishment of Project ENRRICH.

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EXECUTIVE SUMMARY

Freight logistics systems are considered a crucial component of modern societies. The rail sector has been and continues to be a fundamental backbone of the goods movement system in the United States (US). The overall impacts of the growth of international trade and the movement of goods are generally seen as positive. However, society has paid relatively little attention to possible health and other community impacts on local residents who live near goods movement hubs and corridors and who tend to be low-income and minority families. As part of a statewide plan for reducing railroad pollution, the California Air Resources Board (CARB) has conducted a series of health risk assessments of the major railyards in California. According to the Health Risk Assessment (HRA) reports, out of the 18 railyards assessed, the Burlington Northern and Santa Fe (BNSF) San Bernardino Railyard (SBR) ranked 5th in terms of diesel emissions and 1st in projected community health risk. However direct collection of health data on local residents was not part of the health risk assessment process. In response to the need for primary health data, scientists from the Loma Linda University (LLU) School of Public Health developed a research and community engagement initiative, the *Environmental Railyard Research Impacting Community Health (ENRRICH) Project.* To more effectively reach and engage community members, a community based participatory research (CBPR) strategy was employed in collaboration with the Center for Community Action and Environmental Justice (CCAEJ).

Study Purpose

The overall goal of Project ENRRICH was to characterize the community health burden in the residential areas near the SBR, a major goods movement facility located in the City of San Bernardino in inland southern California. Specifically, the fundamental question examined was whether there is a relationship between adverse health effects for residents and proximity to the SBR. This report presents findings of this 2-year public health assessment initiative, conducted with funding from *BP/South Coast Air Quality Management District (AQMD) Public Benefits Oversight Committee*. The overall ENRRICH Project included four major components: 1) a population-based cancer assessment of residents near the SBR (aka Cancer Assessment); 2) a household-level health assessment of adult residents; 3) a children's respiratory health study; and throughout, 4) community engagement toward positive community impacts and mitigation.

1. Cancer Assessment

We conducted a non-concurrent cohort study by extracting annual counts of observed new cancers for 1996-2008 in 16 contiguous Census Tracts overlapping and immediately surrounding the SBR. Data were extracted from the California Cancer Registry (CCR) confidential database for all invasive cancers combined, classifying them by age, sex, and race/ethnicity. Observed new cases were compared with expected numbers of new cancers based on the average annual cancer incidence proportions (rates) for 1998-2002 in the standard Desert Sierra Cancer Surveillance Program (DSCSP; i.e., Mono, Inyo, San Bernardino and Riverside) population and the Tract-specific demographic characteristics reported in the 2000 US Census. Tracts were classified into three exposure categories,

railyard-high, moderate, and low, with each representing higher exposure to diesel emissions than the DSCSP standard population.

All Cancers

We found 1) a statistically significant but modest elevation for both sexes combined, all race/ethnic groups combined (SIR = 1.10; 95% CI: 1.06-1.13); 2) statistical elevations among Hispanic (SIR = 1.18; 95% CI: 1.10-1.27) and non-Hispanic White (SIR = 1.23; 95% CI: 1.13-1.34) male residents; 3) lower than expected cancer counts among Asian/other residents (SIR = 0.75; 95% CI: 0.60-0.93); and 4) no clear evidence of a "dose-response" trend across a hypothesized low-moderate-high exposure gradient within the area defined by the 16 contiguous tracts surrounding the SBR. We did not find evidence of risk elevations for non-Hispanic Black residents.

Site-specific cancers

We found elevations for residents in the high-exposure Census Tracts: (1) a statistical excess of lung/bronchus cancer (SIR = 1.78; 95% CI: 1.09-2.76) among females; (2) non-significant elevations for colon/rectum cancer among females (SIR = 1.13; 95% CI: 0.63-1.87) and males (SIR = 1.44; 95% CI: 0.89-2.20). In the railyard-moderate and low exposure Tracts the results for site-specific cancers did not follow a clear pattern, with mostly null findings mixed with some statistical deficits and elevations. However, results for both sexes combined revealed a pattern of non-significant but increasing SIRs across the low-moderate-high exposure railyard gradient for lung, colon/rectum, and pancreas, suggestive of a possible dose-response trend. When data for all 16 contiguous Census Tracts surrounding the SBR were combined, we found: 1) statistical elevations for breast cancer (SIR = 1.30; 95% CI: 1.06-1.59) among Hispanic residents and for all cancer sites combined among females (SIR = 1.09; 95% CI: 1.01-1.17) and males (SIR = 1.18; 95% CI: 1.10-1.27); 2) statistical elevations for lung/bronchus cancer among non-Hispanic White females (SIR = 1.34; 95% CI: 1.08-1.66) and males (SIR = 1.37; 95% CI: 1.10-1.69); and 3) fewer than expected counts for all cancer sites combined among females and markedly lower than expected counts of colorectal cancer among Asian/other residents.

2. Adult Household-level Study

We used a serial cross-sectional design (summer 2011 and winter/spring 2012 to account for seasonal variations) to conduct household interviews with adult residents who lived at various distances from the SBR. In all, 1,075 household interviews were conducted to collect data fundamentally on the prevalence of respiratory symptoms and conditions as well as two biologic outcomes: Peak Expiratory Flow (PEF) and airway inflammation. In line with the CARB HRA report, data were collected from within three sampling zones, A, B, and C, in the communities surrounding the SBR, representing decreasing levels of air pollution exposure, from highest (A) to lowest or background (C), away from the SBR. We defined exposure based on our sampling regions A, B, and C, which denoted residential distance to the railyard as a proxy of exposure to diesel emissions. Three exposure categories were defined: *Exposed (zones A and B)*, *High Exposure (zone A)*, and *Moderate Exposure (zone B)*. Region C served as our comparison (*background*) group.

Log-binomial regression models were used to estimate the effect of residential proximity as a proxy for exposure to SBR excess emissions on prevalence of self-reported, doctor-told respiratory symptoms and illness, cardiovascular disease (CVD), and two biological measurements: PEF (a lung function indicator) and fractional exhaled nitric oxide, F_{ENO} (a marker of airway inflammation). All models were adjusted for potential confounders including age; sex; race/ethnicity; household income; tobacco use; exposure to environmental tobacco smoke (ETS); time spent outdoors; proximity to nearest major road; and total diesel PM from local sources.

Respiratory tests identified 38% (n=352) of all subjects with low PEF (< 80% of the predicted value, adjusted for gender, age and height). Intermediate to high F_{ENO} values (≥ 25 ppb) were detected for 19% of study participants (n = 178). Nearly one fifth of all subjects reported a doctor-diagnosed respiratory illness (asthma, bronchial conditions, emphysema) and 10% use a physician-prescribed inhaler. With respect to self-reported respiratory symptoms, close to one-third of all subjects (n = 346) experienced frequent morning or nighttime coughing, 40% (n = 429) said they experienced shortness of breath, 27% (n = 288) reported frequent sputum or mucus from lungs, 28% (n = 303) exhibited wheezy breathing, and almost 20% (n = 210) had a doctor-diagnosed respiratory condition. While not statistically significant, a consistent trend of increased prevalence of adverse outcomes was observed from the *Moderate* to the *High* exposure regions. Across endpoints and exposure levels, elevations ranged from small to moderate. The strongest associations were observed for self-reported respiratory symptoms, PR = 1.20, followed by self-reported, doctor-diagnosed respiratory conditions, PR = 1.17, and CVD, PR = 1.15. The weakest associations overall were found for low PEF (PR = 1.06) and intermediate-to-high F_{ENO} (PR = 1.08). The observed associations for respiratory symptoms and CVD were borderline significant.

3. Children's Respiratory Health Study

We used a cross-sectional design to compare two socio-demographically matched elementary schools: the exposure school (ES), located 500 meters directly downwind from the SBR, and the comparison school (CS), located seven miles west, outside the CARB-identified railyard impact zone (RIZ). Parents completed a brief questionnaire containing questions on potential confounding variables, the child's respiratory symptoms and past health history. Using trained and standardized technicians, children's PEF, F_{ENO}, and anthropometric measurements were collected for 1,066 children (74% participation). Linear as well as log-binomial regression models for dichotomous outcomes for PEF (< 80% of their predicted values *vs*. 80+) and F_{ENO} (≥ 20 ppb *vs*. < 20 ppb), with adjustment for potential confounders, were used to calculate prevalence ratios (PR) and 95% confidence intervals (95% CI). Sensitivity analyses were conducted limiting the study population to students who had lived 6+ months at their current address (N=765).

Of the 877 children with complete data, 21% of students had low PEF results and 16.3% had high F_{ENO} values, indicative of airway obstruction and/or lung inflammation. Both the linear regression and log-binomial regression analysis revealed consistent findings across the crude, adjusted, and sensitivity analysis models, indicating that children from the ES exhibited an increased prevalence of poorer PEF results compared to the comparison

school. After adjusting for age, sex, race/ethnicity, ETS, time spent outdoors, median household income, proximity to nearest major road, and local DPM emissions, the ES children experienced a significant 59% increase in the prevalence of reduced PEF compared to the CS children (PR= 1.59, 95% CI: 1.19-2.12). Sensitivity analyses with students who resided 6 months or longer at their current address confirmed the earlier PEF results (PR= 1.41, 95% CI: 1.03-1.92). The findings for FE_{NO} were less clear: no association was found using the linear regression model. However, when using the recommended cutoff of 20 ppb, the children in the ES were 33% more likely to have an abnormal value (PR=1.33, 95% CI: 0.95-1.85) compared to the CS. Sensitivity analyses resulted in estimates becoming stronger and statistically significant (PR=1.44, 95% CI: 1.02- 2.02). Additional analyses of parent-reported outcomes and symptoms identified statistical elevations for cough (PR = 1.74; 95% CI: 1.20-2.51), wheeze (PR = 1.72; 95% CI: 1.23-2.39). Non-significant elevations were observed for parent-reported asthma/inhaler use (PR = 1.30; 95% CI: 0.93-1.82) and ED utilization for respiratory related problems (PR = 1.53; 95% CI: 0.84-2.79).

4. Community Engagement

In working with the community to better understand their challenges and perceptions we conducted focus groups (N=5; 53 community members) and key informant interviews (N=12). In addition, we also added questions to the household survey to assess community needs and perceptions. Responses to questions were coded for recurrent themes and organized into categories.

The findings indicate that community members expressed concern for poor air quality in their community, but that other challenges take higher priority (i.e., jobs, providing for families, access to healthcare). Residents closest to SBR expressed concerned about immediate and tangible issues: police, security, law enforcement; street lighting and repair; and trees and greenery. Participants felt that the railyard has a positive reputation and is highly valued for the jobs and economic growth it provides. However, it was also perceived as a major contributor to the already poor local air quality and seen as a major source of noise pollution. Some participants feel that they have sacrificed for the benefit of the railyard and are concerned about the health impact of life near such a busy freight facility, especially for their children. Residents were vocal on a number of ideas for promoting and sustaining a healthier community and made specific suggestions for the goods movement sector, local government, research institutions and healthcare providers.

Discussion

Findings from the public health assessments conducted under ENRRICH suggest elevations in the prevalence of adverse health outcomes among participants living and/or attending school near the SBR, compared to residents in the background regions outside the CARB-identified RIZ. Not unexpectedly, the prevalence of health effects was stronger for children than for adults, but, overall, there was a consistent trend across endpoints. These results emerged against a complex exposure and population setting. Pervasively high levels of background, transported air pollution and emissions from local sources, together with underlying respiratory health challenges and sociodemographic

homogeneity, define an overall exposure setting within which, *a priori*, it may be difficult to find a distinct pattern of adverse outcomes with respect residential proximity to the railyard facility. Nevertheless, elevations were observed consistently with respect to increasing proximity to the SBR. Although according to data from our own community assessment, indicators of socioeconomic disadvantage seem to improve away from the SBR, residential stability was comparable across the study area and other relevant factors such as exposure to ETS, or past and current tobacco use, actually decrease towards the SBR. This pattern of tobacco use is relevant as it is well known that smoking, a critical risk factor for many chronic diseases, confounds the associations with air pollution.

In gauging the increased adverse health outcomes identified through ENRRICH Study, it is important to determine whether reasonable correlational evidence suggests that the SBR may conceivably contribute to excess health risks in adjacent areas. The overall study results need to be considered in light of the status of the SBR as the largest local emitter, together with the biological plausibility for adverse health effects of diesel pollution, and the potential for enhanced air pollution exposures and toxicity in the areas near the SBR. The absolute amount of diesel emissions, 22 tons annually, attributed to the SBR ranked 5th among the 18 California railyards assessed by CARB. The emissions attributable to the SBR represent 67% of the total diesel PM emissions arising from all stationary and mobile sources within one mile of the facility. In contrast, at the other 17 major California railyards, onsite diesel emissions represent on average 22% of all local diesel emissions. Given that status of the railyard facility as a major local source, the next fundamental issue is the evidence for detrimental human health impacts of diesel PM through plausible physiological mechanisms. Emerging immunologic evidence and the proposed cellular mechanisms fit well with the epidemiologic evidence indicating that exposure to diesel pollution indeed enhances the risk for a wide array of adverse health effects including cancer, respiratory and cardiovascular endpoints. In addition, recently published evidence demonstrates a distinct spatial gradient within the South Coast Air Basin of increased concentrations eastward and greater toxicity of certain organic species found in diesel particles as they are transported inland. Thus there is a plausible scenario of enhanced exposures and toxicity in the SBR region. Residents may be receiving the combined exposures from imported diesel-related pollutants and from the local emissions arising from the SBR. Finally, confounding may increase, decrease, or obscure attribution of the health effects from the ambient exposures. Our models adjusted for age; sex; race; economic differences; smoking status and ETS exposure; time spent outdoors; exposure to local (stationary and mobile) sources of diesel PM and residential proximity to major roads.

Conclusions

The ENRRICH study has identified a significant association with increasing proximity to the local railyard and adverse respiratory health outcomes among children, in an area already plagued with poor background air quality. Although not significant, results for adults follow the same trends toward negative associated adverse health endpoints in the *Moderate* and *High* exposure regions closest to the railyard. While not statistically significant, these findings should be considered relative to their public health implications. The results from the population-based cancer assessment defied in some cases straightforward

interpretations. However some of the findings, such as the risk elevations for Hispanic females and males and for non-Hispanic white males are relevant from a public health perspective and warrant further investigation.

Our models adjusted for relevant confounders, and the fact that even after analytical adjustments we still found modest to moderate elevations across health endpoints does not appear to support a basic hypothesis of no association between residential proximity to the railyard and adverse health outcomes among local residents. It is likely that community perceptions and concerns will not be dissipated. This said, most community members are supportive of the railyard as an employer, both directly and indirectly, but want this to occur minimizing risk as much as can be controlled and wished for the railyard to do more. This includes reducing the noise pollution and being more responsive to the community by implementing more mitigation efforts such as moving the gate from opposite the more densely populated area and schools, using more “clean” engines on site and creating more green barriers to help shield community from the pollution.

While the direct measurement of respiratory health is an important addition to previous modeled research, our study is correlational in nature and clear causality cannot be established. We cannot exclude the possibility that the lack of statistical significance for the findings for our adult study population may simply be the reflection of insufficient statistical power. Further research is warranted with follow-up studies assessing individual level exposures and the long-term health risks associated with chronic exposure in order to confirm/disprove the associations suggested by our analyses.

Under complex scenarios at the interface of science and policy, such as the one concerning the ENRRICH Project, the criteria for practical action do not always match the scientific opinion or consensus on causality. In the spirit of prevention, public health authorities are faced with the difficult task of determining, given the available evidence, if the exposure is sufficiently widespread and the health consequences serious. Notwithstanding its methodological limitations, we believe that the public health implication of our investigation is that residents near major goods movement hubs should be protected from potentially damaging exposures.

INTRODUCTION

Freight logistics systems are considered a vital, and generally beneficial, component of modern societies [1]. The goods movement system in the United States includes a complex network of transportation and logistics segments, of which the rail sector is a fundamental backbone. The overall impacts of the steady growth of international trade and the accompanying nationwide movement of goods are generally seen as positive on the national level because they are thought to promote better access to employment opportunities and cheaper goods and services. Positive impacts are anticipated at many U.S. Atlantic and Pacific port regions as the economy recovers and the pace of global trade picks up speed. However, such benefits should not obscure the potential for undesired consequences. For example, the experience of the communities bordering a goods-movement corridor can be quite different from the general population, but society has paid relatively little attention to possible health threats and other impacts to the communities crisscrossed by the goods movement network. Traditionally, the transportation sector has referred to impacts such as decreasing property values, physical fragmentation of neighborhoods, and even negative health effects as "externalities." For example, while on a per-ton-mile basis the efficiency and environmental benefits of railways in the long-range transportation of goods are undeniable, current technical analyses produced by transportation experts exclude societal impacts and do not account for either onsite movements or intermodal operations [2-4].

Public health scientists are beginning to point to the way in which goods and services are accessed and distributed and various societal, environmental, and health impacts. Conceivably, the transportation of goods can both promote and damage health. A community's health can be enhanced, for example, if transportation activities enable access to jobs and better services. However, goods movement can be health damaging because of impacts such as air pollution, climate change, injuries, noise, stress and anxiety, segregation, loss of land, and blight that can burden local communities. According to Liam Donaldson, Chief Medical Officer for the United Kingdom from 1998 to 2010, "the causes of ill health, the solutions to some of our major health problems and the sustainability of our environment are intricately interwoven with the way that we move from place to place both locally and across the globe. The scope of any analysis in this area of public health also needs to encompass the way that goods and services are accessed and the ways that groups of people gather" [5].

The prospect that local residents who live near ports, railyards, distribution centers, and along high-traffic corridors could be disproportionally impacted by ambient air pollution prompted the State of California to implement emission reduction strategies specifically focused on goods movement [6]. An added concern is that in California, a higher percentage of residents who are from minority or low-income households live near transportation corridors and hubs [7]. Greater exposures resulting from higher levels of ambient air pollutants associated with the goods movement network may contribute to enhanced vulnerability [8-10]. Moreover, low-income, minority families are likely to experience psychosocial stress as they often focus on day-to-day survival, with incipient

evidence suggesting that children from stressed households are even more susceptible to the respiratory health effects of transportation-related pollution [11, 12]. Thus, public health concerns may be compounded by worrisome environmental justice challenges.

Current California Air Resources Board (CARB) guidelines recommend avoiding construction of new schools and residential housing within a mile of a railyard facility. In 2003, the California Legislature passed SB 352, which requires that a school district verify that any railyard within a quarter mile of a new school will not present a public health threat. However, decades ago when residential areas and schools were first built, little was known about the health effects of air pollution, and the nearby roadways, rail lines and facilities were not nearly as busy as they are today. Out of concern that residents who live near major freight hubs may experience disproportionate, cumulative health impacts, a Statewide Railroad Pollution Reduction Agreement (SRPRA) was established between CARB and the rail companies operating in California.[i]

Under the SRPRA, CARB conducted a series of risk assessments of the major railyards in the State following the framework established by the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA). Out of the 18 railyards assessed, the Burlington Northern and Santa Fe Railway Company (BNSF) San Bernardino Railyard (SBR) ranked 5th in California in terms of diesel emissions and 1st in projected community health risk [13]. Concerns about significant health impacts are not unreasonable since this busy facility is in very close proximity to residential neighborhoods and other sensitive receptors such as day care facilities and schools.

The CARB's Health Risk Assessment (HRA) Report on the SBR prompted significant community response and based on several community meetings, many residents were concerned about possible negative health effects , but no actual health *outcome* studies (as opposed to studies that model *impact*) at that time had been conducted to quantify and isolate those impacts and correlate them with emissions. Individual residents and community groups requested action from the City of San Bernardino Mayor's office, community leaders, and researchers from the Loma Linda University School of Public Health to investigate these issues further, with the idea that study results could point the way to mitigation strategies. In response, the City of San Bernardino has worked with community groups and BNSF to identify mitigation measures that could lessen the impact of air pollution caused, directly or indirectly, from the operations of the SBR. However, the City does not possess any direct regulatory influence on the railroads; only the Federal government has jurisdiction over the railroads via the Interstate Commerce clause of the U.S. Constitution.

The health impacts advanced in the HRA Report were not based on health data on specific individuals of the local community. This lack of available information on the actual exposures and disease burden experienced by the local residents limits the opportunities for policy changes since the possibility of adverse health effects is often dismissed due to the indirect nature of the evidence. While a neighborhood-level

[i] For the full text of the agreement: http://www.arb.ca.gov/railyard/ryagreement/ryagreement.htm.

ambient air monitoring study was recently conducted by UCLA scientists to more closely characterize chemically and toxicologically ambient air pollution near the SBR, no formal investigations existed before 2011 on the potential for adverse health outcomes among nearby residents.

Purpose

In response to the need for primary health data for the communities near the SBR, scientists from the Loma Linda University (LLU) School of Public Health (SPH) developed a research and community engagement initiative, the *Environmental Railyard Research Impacting Community Health (ENRRICH) Project.* The overall goal of Project ENRRICH was to characterize the community health burden in the residential areas near the BNSF SBR. Specifically, the fundamental question examined was whether there is a relationship between adverse health effects for residents and proximity to the BNSF SBR. Adopting a community-based participatory research (CBPR) approach, Project ENRRICH represents one of the first public health investigations into the concerns that communities near a goods movement intermodal railyard may face greater cumulative impacts from pollutants.

Health Issues of Concern−Current Research Evidence

The dominant toxic air contaminant associated with the SBR facility is diesel exhaust, a primary contributor to fine particulate matter (PM) concentrations in transport-affected communities. The diesel PM particles are very small, and by mass, are largely dominated by sizes less than 2.5 microns in diameter ($PM_{2.5}$). Because of their small size, diesel PM particles are readily respirable and can penetrate deep into the lungs and enter systemic circulation, carrying with them an array of toxins. Exposure to diesel PM is a health hazard, particularly to sensitive individuals, children (whose lungs are still developing), and the elderly, who may have other serious health problems.

It has been shown that fine particles present in high concentrations near busy roads can elicit oxidative and nitrosative stress in the airways, leading to inflammation, and they have also been correlated with the amount of carbon in the airway macrophages of children, which is in turn associated with impaired lung function [14]. Recent experimental evidence indicates that diesel exhaust particles in the lung aggravate acute renal failure in rats and exacerbate oxidative stress in human embryonic kidney cells[15, 16].

Numerous studies have associated fine PM with a variety of respiratory and cardiovascular problems, such as increased hospitalizations for cardio-respiratory causes, aggravated asthma, other lower respiratory symptoms, acute bronchitis, irregular heartbeat, heart attacks, and premature death in people with heart or lung disease [17-22]. Li et al. have demonstrated that ultrafine particles from incomplete combustion of engine fuels and lubricating oils can bypass the body's defense

mechanisms, gain entry to cells and tissues, and alter or disrupt normal cellular function [23]. There are also concerns about the cancer-causing potential of diesel exhaust based on findings from occupational studies. Silverman and Samanic found an increased risk of death from lung cancer in exposed underground miners [24]. In 2012, the International Agency for Research on Cancer (IARC) classified diesel engine exhaust as Group 1, or carcinogenic to humans, based on sufficient evidence that exposure is associated with an increased risk for lung cancer.

Epidemiologic evidence is gradually mounting on the adverse health effects associated with proximity to transportation facilities and roadways [17-22, 25]. Gauderman et al. have shown that children living near freeway traffic had substantial deficits in lung function development between the ages of 10 and 18 years, compared with children living farther away [26]. Other recent studies have linked traffic exposure to increased risk of low birth weight and premature birth [27]. There seems to be consistent evidence that living near traffic sources is associated with asthma occurrence and exacerbations have reported that adults with asthma who spent 2 hours walking on a street with heavy diesel traffic suffered acute transient effects on their lung function along with an increase in biomarkers that indicate lung and airway inflammation [28, 29]. A German study reports that adults who live for years in close proximity to high volumes of traffic are more likely to develop hardening of the arteries [30]. Recent evidence indicates that in addition to regional air pollution, local exposure to roadways is associated with serious respiratory health effects [26]. For instance, in a study of respiratory diseases among children and the association between exposure to $PM_{2.5}$ and several of its chemical species and hospital admissions researchers found that elemental carbon (a chemical tracer of diesel exhaust) exhibited one of the strongest associations with acute bronchitis, pneumonia, and asthma [31]. This suggests that even in relatively clean areas, children living near major traffic sources are at increased risk, and it also implies that children who live near traffic in a high pollution region experience a combination of both local and regional pollution. This is precisely the case for children living near the SBR, who in addition to high regional levels of air pollution are likely exposed to railyard as well as nearby freeway diesel emissions.

It has been suggested that disadvantaged populations under chronic psychosocial stress may experience greater susceptibility to environmental hazards [32]. In our target community, San Bernardino, 27.6% of residents live below the poverty line and FBI crime statistics report a per capita violent crime rate that is nearly 2.5 times the national average. This regional “double jeopardy” makes it possible to evaluate the interaction of nonchemical and pollution-related stressors in the pathophysiology of disease in this population. Recent data support this strongly. For instance, it has become clear that asthma is a socially patterned disease based on demographic and socioeconomic indicators clustered by areas of residence [33]. In the US, this disease disproportionately affects minority children living in urban areas and children living in poverty [34]. However, the variation in asthma morbidity across urban neighborhoods cannot be explained by socioeconomic factors alone. Specific community characteristics, such as rates of violent crime, are strongly associated with asthma symptoms [33, 35, 36]. In addition, individual-level psychosocial stress is also implicated

in the pathophysiology of asthma [37]. Although both nonchemical and chemical exposures have been independently associated with inflammatory lung disease, their combined interactions have only begun to be evaluated [38-42].

Overview of Report

This report presents the findings from research and community engagement activities conducted under Project ENRRICH funded in 2011 by the BP/South Coast Air Quality Management District (AQMD), Public Benefits Oversight Committee. ENRRICH was aimed at 1) the promotion of partnerships between community members and researchers, and 2) the establishment of objective, baseline information about the prevalence of adverse health effects among residents in areas surrounding the SBR in west San Bernardino. The resulting data can be used to inform a community response to current railyard-related emissions and the resulting environmental impact challenges, including intervention development and organizing toward health ameliorating policy changes.

CHAPTER 1. STUDY AREA AND SETTING

Globalization and international trade have dramatically changed southern California, which has increasingly become a distribution economy. Over 40% of the containerized cargo entering the U.S. flows through the San Pedro Bay ports. Most of it is shipped through some of southern California's poorest neighborhoods on trucks and trains to "inland ports"[ii] for distribution throughout the U.S. heartland.

Since the 1990s, San Bernardino and its immediately surrounding areas in inland Southern California have emerged as a wholesale and trade center for the massive Los Angeles-Long Beach port complex. Its strategic location and the presence of major rail and freeway lines have provided the area with unique surface transportation assets. The Inland Empire is now on the short list of current areas widely recognized as full-fledged "inland ports" in the U.S.[iii] Millions of cargo containers on diesel-powered locomotives and trucks take several rail and freeway routes through southern California to the inland ports, most notably the SBR, from which they are distributed to the rest of the country (**Figure 1-1**). With operations running 24/7, there are between 12-14 intermodal long chain trains that enter or exit the railyard daily, with nearly 500,000 lift operations occurring annually at the facility.

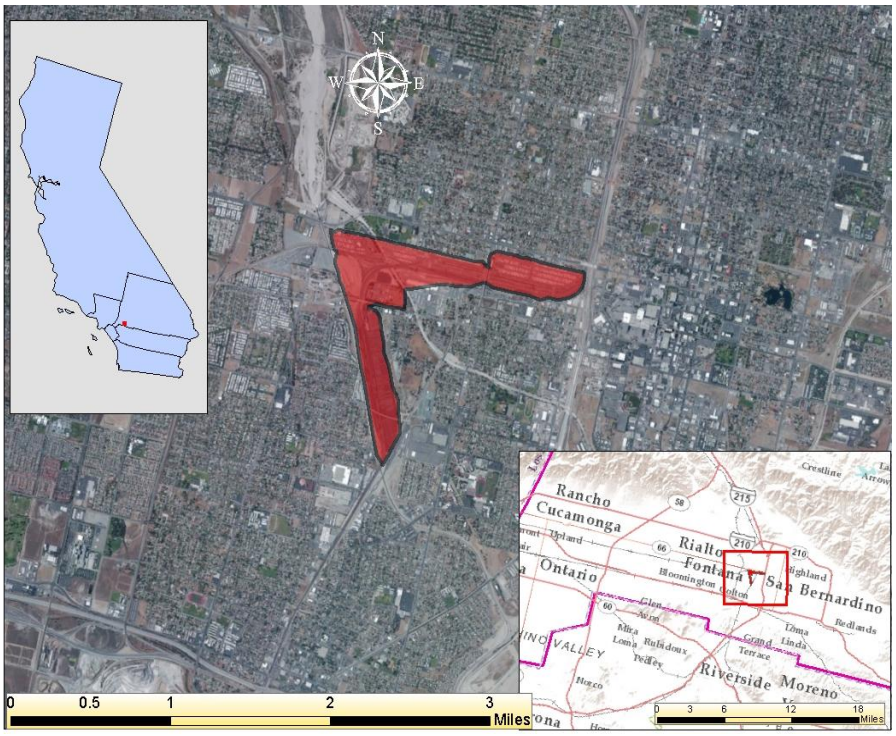

FIGURE 1-1. LOCATOR STATE AND REGIONAL MAPS OF THE BNSF SAN BERNARDINO RAILYARD IN SOUTHWESTERN SAN BERNARDINO COUNTY IN INLAND SOUTHERN CALIFORNIA

The expansion of the logistics sector, coupled with rapid industrialization, have propitiated overall economic growth but have also affected the immediate surrounding areas, which are increasingly plagued with high indices of urban poverty, deprivation, and health

[ii] Inland ports are intermodal logistics hubs connected directly to major maritime ports and are designed to efficiently move international shipments from seaports into inland locations. Inland ports are becoming a critical link in the global supply chain as international trade volume rises.

[iii] The other inland ports in the U.S. are Dallas/Fort Worth, Houston, Chicago, Kansas City, St Louis, Atlanta, Memphis, Columbus, and Charlotte.

disparities, a prime example of which is the west side of the City of San Bernardino, where the SBR is located.

San Bernardino County is located in what is often referred to as the *Third California*, a term used by the Brookings Institution to describe the disparities in health outcomes and economic growth between sub-regions in California [43]. Metro San Bernardino epitomizes the Third California, characterized by dynamic demographic growth—the Inland Empire is the largest and fastest growing metro area in the state—while facing severe problems with pollution, growing congestion, out-migration, racial stratification, and industrial decline. It is one of the most underfunded regions in the state, overshadowed by nearby metropolitan Los Angeles to the west. San Bernardino County has a density of only 102 people per square mile, yet a metropolitan population of more than 2 million. The median age is 32 years, with nearly one third of residents below 18 years of age. It "boasts" the third largest number of gang members in the United States, after Los Angeles and Chicago. The unemployment rate is one of the highest in the country, and he per capita income is less than $30,000 and dropping. High school graduation rates are low and less than one fourth of graduating high school seniors is eligible to enter college. The death rate for children under 5 is one of the highest in California. More than 60 percent of students live in low-income housing and are eligible for subsidized meals. The rate of obesity has increased 26 percent in 4 years, with 36 percent of the population considered overweight (20 percent above ideal) and 32 percent obese (30 percent above ideal weight). This has led to a marked increase in diabetes of 47 percent over the past 5 years, now totaling 10.6 percent of all adults. San Bernardino has one of the worse rates of cardiovascular disease and respiratory cancer in the state and the nation [44]. Southwestern San Bernardino County is also notorious for having some of the highest levels of ambient air pollution in the nation.

San Bernardino and the surrounding areas are considered a “hot zone” for economic development due to its swaths of underdeveloped land, cheaper housing, and relatively inexpensive workforce; thus overall income and other SES levels are lower than those in many other major California counties. Latinos, including undocumented migrant workers, accounted for up to 53% of the county’s population in 2007. Due to the recent immigrant status of many Latinos, one-third of all children of immigrants younger than 6 years old live in “linguistically isolated” homes, in which all persons over 14 years of age have limited English skills. Limited English ability is strongly associated with poverty, food insecurity, and environmental inequity. It also leads to difficulty navigating schools, the health care system, and other services, making Latinos an extremely vulnerable and often overlooked population with respect to environmental justice issues. Available health outcomes data suggest tremendous health disparities between the region’s African Americans and Latinos and the Caucasian population. While the county’s poverty rate is 15.8%, the rate for Latinos stands at 34.9%. This far exceeds the overall poverty rate for the nation, 12.4%, and for the state, which stands at 14.2%. It even exceeds California’s Latino poverty rate of 28% [45]. San Bernardino is one of the area’s poorest municipalities, with a disproportionate number of neighborhoods facing a host of economic, educational, health, and environmental challenges and more recently, the bankruptcy of the city government itself.

The exposure setting specific to the SBR railyard is complex, with many densely populated areas surrounding the facility and with sensitive receptors in close proximity, including schools, daycare centers, nursing homes, and hospitals. According to the CARB's HRA report, the diesel PM emissions from the SBR within 1 mile of the facility are estimated at about 22 tons per year, which represent 66% of the total (i.e., on-site and off-site emissions combined). The concentration of diesel PM and associated carcinogenic risk shows a distinct gradient away from the facility shaped by site-specific topographic and meteorological conditions. **Figure 1-2** shows the SBR and the isopleths that define the risk zones associated with on-site diesel emissions. Near the property boundaries, the estimated excess cancer risk is generally above 500 in a million (assuming a 70-year lifetime exposure duration), with a corresponding exposed population of 4,000 people. The point of maximum impact (PMI, i.e., the location with the highest excess cancer risk level based on the highest diesel PM concentration estimated from the modeling results outside the SBR) is about 3,300 in a million (based on a 70-year lifetime exposure duration), predicted to be along the "A" yard fence line on the north side of the railyard's west intermodal area. The estimated high level of the PMI is primarily due to the density of emission sources near the west intermodal area, where land use is a mix of industrial and dense residential. In the residential area, the maximum individual cancer risk (MICR, or the "potential cancer risk for the maximally exposed individual resident"), which is predicted to occur in close proximity to the PMI, is estimated at about 2,500 chances per million. However, the PMI and MICR indicators are for comparative purposes and should not be interpreted as a literal prediction of cancer incidence.

FIGURE 1-2. ESTIMATED REGIONAL CANCER RISK (CHANCES PER MILLION) FROM THE BNSF SAN BERNARDINO RAILYARD DISPLAYED AS WHITE ISOPLETHS (FROM REFERENCE 13)

It is important to understand that these risk levels represent the potential cancer risks in addition to the regional background risk from diesel PM emissions. To put it in perspective, the estimated regional background risk level in the entire L.A. basin is 1,000 excess cancer cases per million caused by all toxic air pollutants [13]. Therefore, residents living near the MICR location would have a potential cancer risk of about 3,500 in a million (based on an exposure of 70 years). At about 2.5 miles from the SBR, as the diesel PM concentration is projected to decrease, the risk is predicted to drop to about 25 excess cancer cases per million. Finally, further away from this cancer risk zone, risk assessors

identified an area where risk is estimated to be 10 chances in a million (corresponding to the 10 isopleth line on **Figure 1-2**). The overall *railyard impact zone* (RIZ) with an estimated risk above 10 chances in a million (i.e., as delineated by the 10 isopleth risk line in **Figure 1-2**), encompasses approximately 62,000 acres where about 340,000 residents live, based on data from the 2000 U.S. Census Bureau. For this same impact area, we have estimated that nearly 16,000 babies are born annually, based on California Vital Statistics data for the years 2004-2008.

CHAPTER 2. POPULATION-BASED CANCER ASSESSMENT

The Health Risk Assessment (HRA) conducted by CARB for the SBR followed *The Air Toxics Hot Spots Program Risk Assessment Guidelines* published by the California EPA's Office of Environmental Health Hazard Assessment.[iv] The characterization of potential cancer risk in the HRA is based on the railyard-specific emission inventory and air dispersion modeling predictions. In the HRA, mathematical models, together with available toxicity information, were used to estimate potential long-term cancer risk. The HRA did not gather information on specific individuals, but represents an estimate for the potential cancer risk on the population at large near the SBR. The potential cancer risk from a given carcinogen is expressed as the incremental number of cancer cases that could develop per million people, assuming the population is exposed to the carcinogen at a constant annual average concentration over a presumed 70-year lifetime. This risk corresponds with the epidemiologic measure known as excess risk, rather than relative risk, and is not expressed in direct correspondence to any specific cancer type but to overall cancer risk.

We assessed through analyses of California Cancer Registry (CCR) data whether there is an excess in the observed number of new and fatal cancer cases during the 1999 through 2008 time period that could be attributable to diesel smoke and other airborne emissions. For this, we limited analyses to within a theoretical impact area demarcated by a set of census tracts (CTs) surrounding the SBR. On an east/west direction, the investigated CTs are all contained within the area where risk is estimated to be 25 chances in a million (corresponding to the 25 isopleth on **Figure 1-2**). On a north/south direction, the set of CTs is contained within area where cancer risk is estimated to be 50 chances in a million (the 50 isopleth line on **Figure 1-2**). To follow the reporting approach in the HRA, we present results on outcomes for all cancers combined (overall cancer risk) as well as for specific cancer types.

2.1 Background and Justification for Cancer Data Analyses

The San Bernardino Mountains form a natural barrier that channels and traps air pollutants in the San Bernardino Valley [46] surrounding the City of San Bernardino. The hot, dry Santa Ana winds that are common in the autumn and winter months combine with intensive sunshine consistent with the southern latitude to produce a Mediterranean Dry climate zone [46]. The seasonal Santa Ana winds clear the air in the greater San Bernardino area, blowing local smog toward the Pacific coastline [47]. However, during the typical warm and sunny summers, an absence of natural scavenging processes, like rain, and prevailing on-shore breezes coming from the ocean through the Los Angeles metro area contribute to the formation and accumulation of smog and ozone in the region. A higher elevation inversion layer tends to keep lower elevation air pollution layers near the surface, contributing to the accumulation of pollutants in the San Bernardino Valley [48].

[iv] See: OEHHA, 2003. Air Toxics Hot Spots Program Risk Assessment Guidelines: The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. Office of Environmental Health Hazard Assessment. August, 2003.

In addition to the inversion layer and polluted air that migrates from the Los Angeles basin, there are numerous local air pollution sources in the Inland Empire, including pollution from the dense population and numerous freeway and highway systems. The unique topographic and meteorological characteristics and abundance of air pollution sources combine to create the unique conditions which result in San Bernardino being among the worst air pollution areas in the United States (US). Adding to air pollution in the San Bernardino Valley is the BNSF railyard, located in the heart of the City of San Bernardino. The BNSF encompasses an area of approximately 168 acres and is located mainly in a commercial manufacturing area of San Bernardino that is surrounded by private residences. Some homes are as close as 200 feet to the BNSF facility.

About 40 percent of all goods that the U.S receives in overseas shipments enters through seaports in Los Angeles and Long Beach, with much of this freight moved overland to retailers across the country by the BNSF [49]. In addition to the obvious national, statewide, and regional economic benefits provided by the low cost transport of goods throughout the U.S., the San Bernardino BNSF facility is one of 18 California railyards deemed a “risk to public health” by the California Air Resources Board (CARB). CARB ranks the San Bernardino BNSF railyard as the leading contributor to excess carcinogenic risk resulting from air pollution [13].

Concerns about the potential carcinogenic risk posed by the San Bernardino BNSF facility have been raised by air quality regulatory agencies, county and local authorities in San Bernardino and residents living near the facility. While initially the jobs created by the BNSF facility have supported economic growth in the area and were instrumental to the formation and continued viability of San Bernardino, currently few jobs at the railyard are actually held by residents living near the San Bernardino BNSF facility and for some of them any direct economic benefits are countered by higher air and noise pollution levels endured by those.

Some studies have identified increased risk of lung cancer in city dwellers [50, 51], exposed to diesel exhaust, attributing this association to urban air pollution, while other scientists note that urban residence frequently predicts higher tobacco use [52, 53], the principle risk factor for lung and numerous other cancer types. Though it is unethical to conduct high-dose exposure studies in humans, animal studies have provided direct evidence of a carcinogenic effect of high-dose diesel exhaust exposure [54, 55].

Epidemiologic investigations of the relationship between diesel exhaust and cancer are challenged by indirect exposure assessments and have encountered difficulty when attempting to distinguish the consequence of diesel exposure from other, confounding factors, including tobacco use [54]. Ensuring an abundance of caution, the U.S. National Toxicology Program classifies diesel exhaust particulate exposure as “reasonably anticipated” [56] to be a human carcinogen and the U.S. Environmental Protection Agency ranks diesel exhaust as “likely” to be carcinogenic in humans [57].

The main route of human exposure to diesel exhaust is through inhalation; about 10 percent of the diesel particles trapped in airways are deposited in the alveolar region of the lung [57], in the tissue where the majority of glandular lung cancer arises. Predictive

models of the deposition of inhaled diesel exhaust particles in humans are based on research conducted in laboratory animals, considering particle and airway size, concentration, and exposure duration [57]. Although the mechanism through which diesel exhaust may cause malignancies in humans is not established, it is reasonable to presume that carcinogenic effects could be related to the small size of diesel exhaust particles, combined with the genotoxicity of highly reactive polycyclic-aromatic hydrocarbons in diesel exhaust that condenses in respiratory airways. Another proposed mechanism of carcinogenesis involves inflammatory processes that lead to increased hyper-, meta-, and dysplastic changes in respiratory tissue [57, 58].

The HRA conducted in the area surrounding the SBR used average annual air pollution emissions, air dispersion modeling, and assumptions about health risks associated with diesel PM pollution [13]. Following OEHHA guidelines, this assessment estimated the potential cancer risk by using a diesel PM cancer potency factor of 1.1 per mg/kg-day. This cancer potency factor was derived by the OEHHA for PM from diesel-fuel engines and was based on a review and meta-analysis of over 30 epidemiological studies of occupational exposure to diesel exhaust and lung cancer.[v] The exposure assumption is of continuous exposure to the diesel emissions that a human would receive from living in the vicinity of the SBR facility for a lifetime (70 years). Using this methodology, the investigators concluded that approximately 2,500 to 3,300 excess new cancers would occur per million persons receiving a lifetime exposure to excess air pollutants emitted by the BNFS facility along the north yard fence line [13]. Risk was modeled to drop to 10 excess cancer cases at about 5 miles from the railyard.

The community cancer assessment component of the ENRRICH research project, funded by the South Coast AQMD, used secondary data from the California Cancer Registry (CCR) [59] to determine whether an excess in the number of new cancers occurred among residents of the area surrounding the SBR from 1996-2008. CCR is the mandated, statewide cancer surveillance system that serves approximately 37 million California residents. The Desert Sierra Cancer Surveillance Program (DSCSP), also known as Region 5 of the CCR, is the regional division of the CCR, serves the approximately 4.1 million residents of Inyo, Mono, Riverside, and San Bernardino counties, adding approximately 14,000 new cancers per year [59].

The general objective of the cancer analyses sub-study was to evaluate all and site-specific cancer occurrence against expected counts for invasive cancers combined for the collection of 16 contiguous San Bernardino County Year 2000 Census tracts surrounding the BNSF railyard. Detailed objectives included assessment of three hierarchal air pollution exposure areas modeled on excess diesel exhaust emissions from the BNSF railyard as railyard- high, moderate, and low excess air pollution areas.

[v] For a description of how the diesel PM cancer potency was derived and the diesel exposure studies that were reviewed: OEHHA, 2002. Air Toxics Hot Spot Program Risk Assessment Guidelines: Part II-Technical Support Document for Describing Available Cancer Potency Factors. Office of Environmental Health Hazard Assessment. December, 2002.

2.2 Methods

We conducted a non-concurrent cohort study by extracting annual counts of observed new cancers for 1996-2008 in the study area from the CCR confidential database for all invasive cancers combined [59, 60]. Observed new cases were identified by residence address at diagnosis in 16 contiguous San Bernardino County Year 2000 census tracts surrounding the BNSF railyard in the City of San Bernardino. Tracts were classified into each of three BNSF HRA report exposure zones as railyard- high, moderate and low, with each representing higher exposure to diesel emissions than the standard (DSCSP) population.

Within each exposure area, individuals were classified using age- (<1, 1-4, 5-9, 10-14,….80-84, and 85+ years), sex-, and race/ethnicity- (Asian/other, Hispanic, non-Hispanic Black and non-Hispanic White) specific mutually exclusive categories [59]. The Asian/other classification included persons recorded as Pacific Islander, Native American (American Indian), Native Alaskan, mixed race, unknown race or ethnicity, or members of racial groups not included in any of the other three race/ethnicity categories. Persons listed as Black, White, or race unknown on a death certificate or medical record having a Hispanic surname were categorized as Hispanic, while persons listed as Black, African, or African American not having Hispanic surnames were classified as non-Hispanic Black. Similarly, persons listed as White or Caucasian in medical records, not having a Hispanic surname, were classified as non-Hispanic White.

Cases reported in the DSCSP database for 1996-2008 included approximately 100 percent of counts projected for the area population [59]. Expected numbers of new cases were computed for each of the census tracts in the study using average annual cancer incidence proportions (rates) for 1998-2002 in the DSCSP and the demographic characteristics for each census tract reported in Census 2000. Year 2000 Census and post-2000 Census population estimates [61, 62] were used to adjust expected counts for population change during non-census years using a fitted linear regression equation, interpolating annual population estimates for each year during the study period. These methods allow adjustment for change in population size during the study period. Findings compare observed and expected numbers of new cancers for the entire study population and within each of the three homogeneous exposure areas, adjusting for variations in age, sex, SES, race/ethnicity, and population size distributions, and for changes in population size during the study period [63]. Unique demographic features of population subsets residing in each of the exposure areas also provided the opportunity to evaluate the effects of tobacco use on cancer occurrence [64].

Similar demographic categories were used to define the observed counts and DSCSP incidence rate denominators (1998-2002), with population count detail obtained from the National Center for Health Statistics, bridged population estimates for 1990-1999 and 2000-2010 [61, 62]. Average annual Year 2000 incidence rates were computed by dividing new cancer counts in the DSCSP for 1998-2002 in each of the 152 unique demographic categories by corresponding DSCSP denominators. Demographic factor-specific, average annual rates were multiplied by the proportional distribution of the population residing within each the 16 census tracts for each of the 152 demographic factor-specific (19 age,

2 sex, and 4 race/ethnicity) categories [65]. These expected annual cancer rates were multiplied by the size of the Year 2000 population residing in each of the census tracts, yielding expected counts for each tract during Year 2000. Census tract-specific expected counts for Year 2000 were weighted by the proportion of the Year 2000 population for each year from1996-2008, with these counts summed for the 13 year study period to form age, sex, race/ethnicity, and population size adjusted expected counts for each of the 16 census tracts during the 13 year study period [63].

Collectively, these standard analytical methods and the CCR data were used to compute standardized incidence ratios (SIR) for all cancer types combined by dividing the observed number of new cancer cases for each tract or collection of tracts by the age-adjusted, race/ethnicity-specific or adjusted, population size-adjusted, and sex-specific or combined expected counts for the same census tract or collections of tracts. Ninety-five percent confidence interval limits (95% CI) for observed counts were computed using an equation based on the Poisson distribution [65]. Data analyses were conducted using SEER* Stat [66] , Microsoft Excel, and SAS version 9.2 software [67].

Railyard- high, moderate, and low exposure categories were defined by incorporating into our analysis the spatial output (**Figure. 1-2**) presented in the HRA, which was derived in turn from the U.S. Environmental Protection Agency's **A**merican Meteorological Society/**E**PA **R**egulatory **MOD**el (AERMOD) [68]. This air dispersion model assumes a steady-state plume and is based on mathematical relationships that incorporate air dispersion characteristics established for planetary boundary layer turbulence, structure and scaling concepts, surface and elevation characteristics, and both simple and complex terrain features [13]. The emission sources from locomotives and other diesel particulate matter (PM) sources at the BNSF San Bernardino Railyard were considered as the '*source types*' in the dispersion modeling.

Using GIS techniques, isopleths were converted into a polygon layer. Each polygon in this layer was used to model a "homogeneous" exposure zone and was assigned a proxy "exposure" score calculated as the average of the cancer risk levels of the bounding isopleths (**Figure 1-2**). For example, the risk polygon delineated by isopleths 10 and 25 received an exposure score of 17.5, etc. The 500-risk zone is defined by a single isopleth (**Figure 1-2**) and therefore the corresponding polygon received an exposure score of 500.

The risk polygons were next overlaid with Year 2000 CT boundary maps used to distinguish the excess air pollution exposure areas associated with the BNFS facility. The overlay procedure results in the splitting of the CTs, with each new polygon representing a unique CT-exposure combination. Next, using this new polygon layer, a set of area weights was developed based on the proportion of a tract covered by the various exposure zones. Each weight was calculated as the ratio of the areal extent of a given polygon to the area of the parent CT. Each CT then received a final value corresponding to an area-weighted CT-wide average exposure score. Finally, we applied a clustering method to classify the CTs into exposure groups from the area-weighted exposure scores.

We employed a *Natural Breaks* method, based on the Jenk's mathematical algorithm, available from the ArcGIS software (Esri, Redlands, California), which implements repeated sampling and resampling to identify natural groupings in an empirical dataset [68]. Through this approach we identified three exposure areas: the highest impact region (high excess exposure area), and two outlying "rings" (moderate and low excess exposure areas) surrounding the highest exposure zone. The map in **Figure 2-1** depicts the railyard and surrounding Census tracts color-coded according to this exposure level. The "high" exposure area included tracts 4800 and 4900. The "moderate" exposure area included tracts 4300, 4700, 5600, 5700, and 6700. The "low" exposure area consisted of tracts 4201, 4202, 4401, 4402, 5000, 5900, 6600, 6800, and 7000.

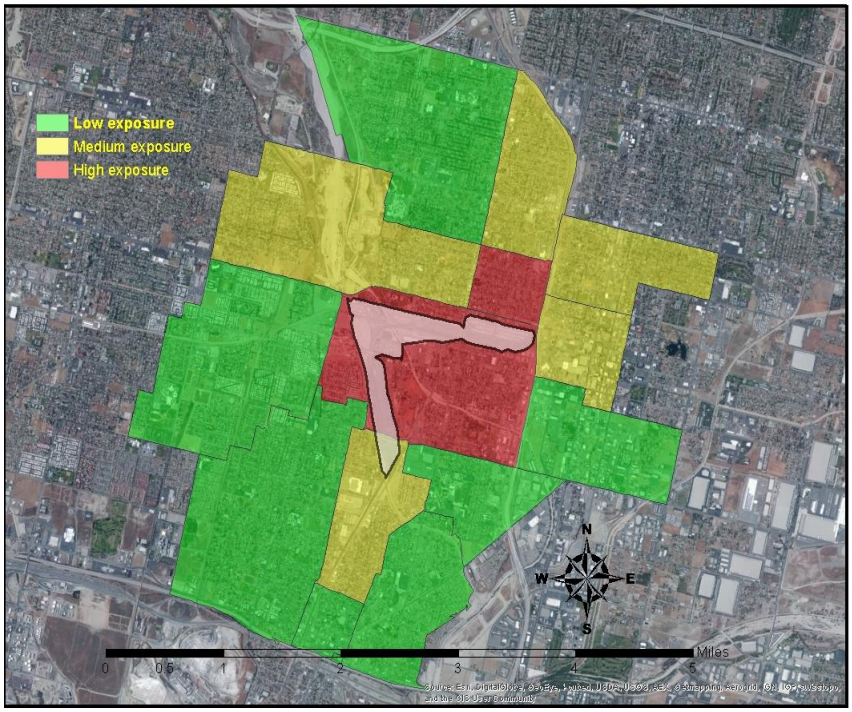

FIGURE 2-1. MAP OF THE SAN BERNARDINO RAILYARD (WEDGE-LIKE SHAPE IN THE CENTER) AND ADJACENT CENSUS TRACTS USED IN THE CANCER ASSESSMENT. CENSUS TRACTS ARE COLOR CODED ACCORDING TO THE MODELED DOSE-RELATED RELATED RAILYARD EMISSION EXPOSURE LEVELS: LOW (GREEN), MEDIUM (YELLOW), AND HIGH (RED).

2.3 Results

2.3.1 All Cancer Sites Combined

Population counts, percentages, and global statistical significance tests with descriptive findings for each of the demographic characteristics in the railyard-high, railyard-moderate, and railyard-low excess exposure areas; all 16 census tracts combined; and the DSCSP are provided in **Table 2-1**. Almost 12% of the railyard study population lived in the railyard-high exposure area, with 25,247 (30.6%) and 47,552 (57.6%) living in railyard- moderate and railyard-low exposure areas, respectively. The standard population of the DSCSP included 3,284,175 residents. Marked differences are seen for the age- and race/ethnicity-distributions for each of the railyard exposure area populations compared with each other and the DSCSP standard population. Each of the railyard exposure populations exhibited a younger age-distribution than the DSCSP.

TABLE 2-1. AGE, SEX, RACE/ETHNICITY†, AND SOCIOECONOMIC STATUS (SES) DISTRIBUTION IN RAILYARD HIGH, MODERATE, AND LOW EXPOSURE AREAS, AND ALL RAILYARD EXPOSURE AREAS COMBINED, COMPARED TO THE DSCSP IN 2000. DATA ARE FROM THE CALIFORNIA CANCER REGISTRY.

Demographic Variables	Railyard High		Railyard Moderate		Railyard Low		All 16 Census Tracts Combined		DSCSP	
Age	Count	%	Count	%	Count	%	Count	%	Count	%
0-19	4,309	44.19%	10,233	**40.53%**	19,309	**40.61%**	33,851	**41.01%**	1,128,960	**34.38%**
20-39	3,043	**31.20%**	7,222	**28.61%**	13,579	**28.56%**	23,844	**28.88%**	935,222	**28.48%**
40-49	1,082	**11.10%**	2,957	**11.71%**	5,760	**12.11%**	9,799	**11.87%**	465,724	**14.18%**
50-74	1,059	**10.86%**	3,781	**14.98%**	7,148	**15.03%**	11,988	**14.52%**	594,309	**18.10%**
75+	259	**2.66%**	1,054	**4.17%**	1,757	**3.69%**	3,070	**3.72%**	159,960	**4.87%**
	p<0.001		p<0.001		p<0.001		p<0.001		Reference	
Sex										
Males	4,939	**50.65%**	12,529	**49.63%**	23,264	**48.92%**	40,732	**49.34%**	1,637,056	**49.85%**
Females	4,813	**49.35%**	12,718	**50.37%**	24,289	**51.08%**	41,820	**50.66%**	1,647,119	**50.15%**
	p=0.11		p=0.48		p<0.001		p=0.004		Reference	
Race/Ethnicity										
A/O	226	**2.32%**	968	**3.83%**	2,520	**5.30%**	3,714	**4.50%**	245,126	**7.46%**
NHB	607	**6.22%**	3,610	**14.30%**	7,004	**14.73%**	11,221	**13.59%**	242,236	**7.38%**
Hisp	8,182	**83.90%**	17,990	**71.26%**	30,851	**64.88%**	57,023	**69.08%**	1,233,214	**37.55%**
NHW	737	**7.56%**	2,679	**10.61%**	7,178	**15.09%**	10,594	**12.83%**	1,563,599	**47.61%**
	p<0.001		p<0.001		p<0.001		p<0.001		Reference	
SES										
1 Lowest	9,752	**100%**	25,247	**100%**	43,853	**92.22%**	78,852	**95.52%**	872,292	**26.56%**
2	0	-	0	-	3,700	**7.78%**	3,700	**4.48%**	981,579	**29.89%**
3	0	-	0	-	0	-	0	-	764,684	**23.28%**
4	0	-	0	-	0	-	0	-	506,135	**15.41%**
5 Highest	0	-	0	-	0	-	0	-	159,485	**4.86%**
	-		-		p‡<0.001		p‡<0.001		Reference	
Total	**9,752**	**100%**	**25,247**	**100%**	**47,553**	**100%**	**82,552**	**100%**	**3,284,175**	**100%**

† A/O signifies Asian/other, NHB is non-Hispanic Black, Hisp is Hispanic, and NHW is non-Hispanic White race/ethnicity
‡ P signifies the probability from the X^2 for independence test for rows minus 1 degrees of freedom contrasting findings for railyard exposure categories with the DSCSP.

Slight differences in the sex distributions were evident for the railyard high excess exposure area (50.7% male) compared to the moderate (49.6% male), low (48.9% Male), and DSCSP (49.9% male) distributions. The race/ethnicity distributions for each of the exposure areas included substantially more persons of Hispanic ethnicity than the DSCSP, with the percent of railyard excess exposure areas that were classified as Hispanic showing a stepwise increase for excess exposure area low (64.9%), moderate (71.3%), and high (83.9%), compared to the DSCSP (37.6% Hispanic). Reverse patterns were evident for each of the other race/ethnic categories in the low, moderate, and high excess air pollution exposure areas.

All census block groups in the railyard-high and moderate excess exposure areas were classified in the lowest SES quintile, while 43,853 (92.2%) residents of the railyard-low

exposure population was classified in the lowest California SES quintiles. Among the 47,553 residents of the railyard-low exposure tracts, 3,700 (7.8%) lived in census block groups ranked second to the lowest SES quintile for the state (**Table 2-1**). Collectively, these findings reveal that 95.6 percent of the entire 16 census tract study population was classified in the lowest SES quintile for California, with the remainder residing in census block groups classified in the second from the lowest SES quintile.

All three railyard exposure areas exhibited higher air pollution levels than the average for the surrounding Inland Empire area and DSCSP region. In addition to the higher than average air pollution levels that combine ambient Inland Empire SMOG with high, moderate, and low excess air pollution emissions from the BNSF facility, the population surrounding the San Bernardino BNSF facility is demographically unique in terms of age, race/ethnicity, and SES characteristics. **Table 2-1** reveals that 41 percent of the 82,552 residents of the combined railyard high, moderate, and low excess exposure areas were less than age 20 years in 2000, compared to 34.3 percent in the DSCSP population. The younger age of the study population in light of the increased vulnerability inherent in growing children underscores the importance of protecting youth from the potential adverse effects of air pollution that may cumulate over a lifetime and could have detrimental consequences during early life.

Among the remarkable demographic features of the railyard exposure area population is the substantial proportion characterized by Hispanic ethnicity. As presented in **Table 2-1**, 69 percent of the combined railyard excess exposure population is Hispanic. The proportion of Hispanic residents increases from lowest to highest in the railyard low (64.9%), moderate (71.3%), and high (83.9%) railyard exposure areas.

In addition to the unique age and ethnic characteristics of the population surrounding the BNSF facility is the remarkably low SES of this population. One hundred percent of the population residing in the railyard high and moderate BNSF excess exposure areas resides in Year 2000 census block groups ranked in the lowest SES quintile for California. This compares to 26.6 percent of the DSCSP population in the lowest SES quintile. Approximately 92 percent of the railyard low excess exposure population also resides in block groups classified in the lowest SES quintile for California, with the remaining 8 percent living in the second to the lowest SES quintile block groups (**Table 2-1**). The distinctive demographic features of youth, poverty, and Hispanic ethnicity, combined with the potential for language and cultural barriers to health information, underscores the importance of safeguards that ensure the protection of this demographically unique and likely underserved segment of the San Bernardino city population.

Table 2-2 presents standardized incidence ratios (SIRs) with 95 percent confidence interval limits for SIRs depicting ratios of observed to expected new cancer cases in each of the four major race/ethnic groups. SIR findings in **Table 2-2** are presented for females, males, and sexes combined and are adjusted for the age. We found statistically elevated numbers of observed new cancers, relative to expected counts, among Hispanic and non-Hispanic White residents that represent nearly 82 percent (**Table 2-1**) of the combined railyard excess exposure area population. Disparate SIR findings for various race/ethnic groups, presented in **Table 2-2**, challenge a simple assertion that exposure to excess air

pollutants from the SBR is responsible for a cancer excess in the surrounding community. It is reasonable to surmise that differences in residency and exposure duration exist for various race/ethnic groups, with recent residents having exposure durations short of the latency period between exposure and increased cancer occurrence. Assuming that the non-Hispanic Black population is largely composed of recent residents of the railyard exposure area, this conjecture could explain the null findings identified in this race/ethnic group. This argument could only explain the markedly lower observed count of new cancers measured among Asian/other residents of the railyard exposure area, compared to the adjusted expected number (**Table 2-2**), if a substantial fraction of this race/ethnic group migrated from areas having markedly lower cancer occurrence than the DSCSP.

Differences in tobacco use between race/ethnic groups could at least partly explain the markedly higher cancer occurrence among non-Hispanic White males (**Table 2-2**). Tobacco use has traditionally been highest among lower socioeconomic status White males [69]. Nevertheless, this interpretation is challenged by the absence of any excess in observed to expected cancer counts among non-Hispanic Black males, who also reside in low SES census tracts and represent the second highest [69] or highest [70] tobacco use among major race/ethnic groups in the US [69] and California [70], respectively. Findings for higher than expected observed counts for new cancers among Hispanic females and males (**Table 2-2**) may provide the strongest evidence that excess air pollution emissions from the BNSF railyard could contribute to an excess in observed cancer counts. Nevertheless, this interpretation would not explain the differences in SIR findings for race/ethnic groups residing in the excess air pollution area studied.

Table 2-3 presents standardized incidence ratios (SIRs) with 95 percent confidence interval limits for SIRs depicting ratios of observed to expected new cancer cases in each of the three modeled railyard air pollution categories. SIRs are presented separately for females, males, and combined for the sexes, and are adjusted for the age and race/ethnicity characteristics of the study populations measured during the Year 2000 Census.

The ratio of observed to expected counts of new cancers among female residents of the railyard high excess exposure area showed a slightly elevated observed count compared to the age- and race/ethnicity-adjusted expected number (SIR=1.10; 95% CI=0.93-1.29), while the finding for male residents of the railyard high exposure zone was not elevated (SIR=0.95; 95% CI=0.80-1.13) (**Table 2-3**). Findings for female (SIR=0.66; 95% CI=0.61-0.72) and male (SIR=0.73; 95% CI=0.67-0.79 residents of the moderate excess exposure zone showed markedly fewer observed counts of new cancers than age- and race/ethnicity-adjusted expected counts. The finding for the railyard low exposure zone was null for females (SIR=0.99; 95% CI=0.93-1.06) and slightly elevated among males (SIR=1.09; 95% CI=1.02-1.16) (**Table 2-3**).

TABLE 2-2. OBSERVED (O) AND EXPECTED (E) COUNTS, AGE-STANDARDIZED INCIDENT RATIOS (SIR_S) AND 95 PERCENT CONFIDENCE INTERVAL LIMITS (95% CI) FOR SIR_S AMONG ALL CANCERS COMBINED BY SEX AND RACE/ETHNICITY† AND COMBINED FOR 16‡ CENSUS TRACTS (3 RAILYARD EXPOSURE AREAS) COMBINED, 1996-2008.

All Race/Ethnic Groups Combined					Asian/Other† 2.3.1.1					Non-Hispanic Black					Hispanic					Non-Hispanic White				
Count		SIR	95% CI		Count		SIR	95% CI		Count		SIR	95% CI		Count		SIR	95% CI		Count		SIR	95% CI	
O	E	(O/E)	LL	UL	O	E	(O/E)	LL	UL	O	E	(O/E)	LL	UL	O	E	(O/E)	LL	UL	O	E	(O/E)	LL	UL
										FEMALES														
1,572	1,483.7	**1.06**	1.01	1.11	41	57.6	**0.71**	0.51	0.97	296	283.4	1.04	0.93	1.17	750	689.8	**1.09**	1.01	1.17	485	452.8	1.07	0.98	1.17
										MALES														
1,714	1,515.5	**1.13**	1.08	1.19	45	56.8	0.79	0.58	1.06	333	348.6	0.96	0.86	1.06	797	673.3	**1.18**	1.10	1.27	539	436.7	**1.23**	1.13	1.34
										BOTH SEXES														
3,286	2,999.2	**1.10**	1.06	1.13	86	114.4	**0.75**	0.60	0.93	629	632.1	1.00	0.92	1.08	1,547	1363.2	**1.13**	1.08	1.19	1,024	889.5	**1.15**	1.08	1.22

†Asian/other includes Asia n, Pacific Islander, and mixed race/ethnic groups and persons not classified in the other race /ethnicity categories. NH signifies non-Hispanic ethnicity, regardless of Black and White designation.
‡16 Census tracts combined include the 16 San Bernardino County year 2000 Census tracts in the vicinity of the SBR including tracts 4201-4202, 4401-4402, 4300, 4700-4900, 5500-5700, 5900, 6600-6800, and 7000.

TABLE 2-3. OBSERVED (O) AND EXPECTED (E) COUNTS, AGE-, RACE/ETHNICITY-ADJUSTED†, SEX-SPECIFIC AND COMBINED STANDARDIZED INCIDENT RATIOS (SIRS) WITH 95 PERCENT CONFIDENCE INTERVAL LIMITS (95% CI) FOR SIR_S IN HIGH, MODERATE, AND LOW RAILYARD AIR POLLUTION EXPOSURE AREAS‡, 1996-2008.

Railyard High					*Railyard Moderate*					*Railyard Low*				
O	E	O/E	LL	UL	O	E	O/E	LL	UL	O	E	O/E	LL	UL
							FEMALES							
149	135.43	1.10	0.93	1.29	489	738.01	0.66	0.61	0.72	934	943.30	0.99	0.93	1.06
							MALES							
132	138.91	0.95	0.80	1.13	545	751.71	0.73	0.67	0.79	1,037	953.25	1.09	1.02	1.16
							SEXES COMBINED							
281	274.35	1.02	0.91	1.15	1,034	1489.71	0.69	0.65	0.74	1,971	1896.56	1.04	0.99	1.09

†Expected counts for each railyard exposure area are adjusted using indirect age-standardization 22 for age and race/ethnicity using 19 unique age categories ranging from age <1, 1-4, 5-9, 10-14, …, 80-84, and 85+ years; race/ethnic categories are defined in the methods section and in the footnotes for Table 3-2.
‡Railyard high excess exposure includes Census 2000 tracts 4800 and 4900, moderate excess exposure includes tracts 4300, 4700, 5600, 5700, and 6700, low excess exposure includes tracts 4201, 4202, 4401, 4402, 5000, 5900, 6600, 6800, and 7000, and the railyard combined category includes all 16 census tracts.

2.3.2 Specific Cancer Types

We conducted additional analyses for specific cancer types having different etiologic mechanisms. The results from these analyses are summarized in **Tables 2-4** and **2-5** below. **Table 2-5** includes results according to predicted level of exposure: high, moderate, and low. These three categories of surrogate exposure were derived according to the methods described in the Methods section above. Statistically higher than expected occurrence (SIR = 1.78; 95% CI = 1.09-2.76) of lung and bronchus cancer observed among female residents of the railyard high exposure area is perplexing given the lower than expected count for the same cancer among male residents, and null findings for lung and bronchus cancer among residents of the railyard moderate and low excess exposure areas.

Since rates of tobacco use among our Hispanic female respondents in our most impacted area are low, it is reasonable to argue that female residents in this high excess exposure area could have greater exposure to emissions from the SBR facility than males, as males mostly work outside of the area while females are more likely than males to work at home. While the **Table 2-4** findings are derived from all 16 CT areas, they reveal that female and male excess occurrence of lung and bronchus cancer in the railyard high, moderate and low excess exposure areas is substantially limited to non-Hispanic White residents, with this race/ethnic group characterized by greater than average past tobacco use. Slightly lower than expected counts for all cancers combined and for non-Hodgkin's lymphoma among residents of the railyard moderate exposure CTs represents a serendipitous finding.

Male excess occurrence of colorectal cancer was also observed in the high and moderate exposure areas but not in the low exposure region. These non-significant elevations followed an attenuation pattern across the exposure regions: high exposure—SIR = 1.44 (95% CI = 0.89-2.20); moderate exposure—SIR = 1.20 (95% CI = 0.93-1.51); and low exposure—SIR = 0.96 (95% CI = 0.78-1.17). A somewhat similar pattern of non-significant decreasing elevations across exposure areas was also observed for lung and bronchus, colon and rectum, and pancreatic cancers when the data for both sexes were combined (**Table 2-5**). In the high exposure areas, excess occurrences were SIR = 1.12 (95% CI: 0.75-1.61), SIR = 1.29 (95% CI: 0.90-1.79), and SIR = 1.43 (95% CI: 0.68-2.65) for lung, colon and rectum, and pancreas cancer, respectively. In the moderate exposure region, only lung and bronchus and colon and rectum cancers remain slightly elevated, SIR = 1.02 (95% CI: 0.85-1.22) and SIR = 1.03 (95% CI: 0.85-1.23). No elevations were found for those same three cancers in the low exposure area.

Findings included in **Table 2-4** depict slightly fewer than expected counts for all cancer sites combined among Asian/other females and for both sexes combined and markedly lower than expected counts of colorectal cancer among Asian/other residents of the 16 CTs surrounding the BNFS San Bernardino railyard. Hispanic female (SIR = 1.09; 95% CI: 1.01-1.17), male (SIR = 1.18; 95% CI: 1.10-1.27) and sexes combined (SIR = 1.13; 95% CI: 1.08-1.19) experienced slightly higher observed counts of all cancers combined. In all three cases the elevations were statistically significant.

TABLE 2-4. OBSERVED (O) AND EXPECTED (E) COUNTS, RACE/ETHNICITY-SPECIFIC AND SEX-SPECIFIC AND COMBINED AGE-STANDARDIZED INCIDENCE RATIOS (SIRS) WITH 95 PERCENT CONFIDENCE INTERVAL LIMITS (95% CI) FOR SIRS IN 16 CENSUS TRACTS COMBINED† IN THE VICINITY OF THE BNSF RAILYARD, 1996-2008.

	Asian/Other‡					NH Black					Hispanic					NH White				
Cancer	Count		SIR	95% CI		Count		SIR	95% CI		Count		SIR	95% CI		Count		SIR	95% CI	
Site¥	O	E	(O/E)	LL	UL	O	E	(O/E)	LL	UL	O	E	(O/E)	LL	UL	O	E	(O/E)	LL	UL
FEMALES																				
All Sites	41	57.59	**0.71**	0.51	0.97	296	283.44	1.04	0.93	1.17	750	689.85	**1.09**	1.01	1.17	485	452.82	1.07	0.98	1.17
Lung	<5	<5	0.21	-	-	41	39.85	1.03	0.74	1.40	63	65.52	0.96	0.74	1.23	87	64.80	**1.34**	1.08	1.66
Breast	15	18.53	0.81	0.45	1.34	74	85.93	0.86	0.68	1.08	96	73.57	**1.30**	1.06	1.59	136	145.24	0.94	0.79	1.11
CRC	<5	<5	0.62	-	-	40	38.70	1.03	0.74	1.41	215	212.10	1.01	0.88	1.16	54	50.63	1.07	0.80	1.39
Pancreas	0	1.20	N/A	-	-	11	9.93	1.11	0.55	1.99	14	16.53	0.85	0.46	1.42	9	11.35	0.79	0.36	1.51
NHL	<5	<5	0.45	-	-	6	8.64	0.69	0.25	1.52	33	35.35	0.93	0.64	1.31	16	17.40	0.92	0.52	1.50
MALES																				
All Sites	45	56.85	0.79	0.58	1.06	333	348.64	0.96	0.86	1.06	797	673.32	**1.18**	1.10	1.27	539	436.72	**1.23**	1.13	1.34
Lung	<5	<5	0.58	-	-	49	56.37	0.87	0.64	1.15	41	48.66	0.84	0.60	1.14	86	62.71	**1.37**	1.10	1.69
CRC	<5	<5	0.15	-	-	34	35.50	0.96	0.66	1.34	208	191.75	1.08	0.94	1.24	57	47.08	1.21	0.92	1.57
Prostate	12	17.36	0.69	0.36	1.21	120	137.24	0.87	0.72	1.05	57	62.76	0.91	0.69	1.18	122	123.59	0.99	0.82	1.18
Pancreas	<5	<5	1.82	-	-	12	8.14	1.47	0.76	2.58	17	19.16	0.89	0.52	1.42	11	9.86	1.12	0.55	2.00
NHL	<5	<5	0.39	-	-	6	10.03	0.60	0.22	1.31	28	30.77	0.91	0.60	1.32	16	18.63	0.86	0.49	1.40
SEXES COMBINED																				
All Sites	86	114.43	**0.75**	0.60	0.93	629	632.09	1.00	0.92	1.08	1,547	1,363.2	**1.13**	1.08	1.19	1,024	889.54	**1.15**	1.08	1.22
Lung	5	11.57	0.43	0.14	1.02	90	99.41	0.91	0.73	1.11	104	112.48	0.92	0.76	1.12	173	127.51	**1.36**	1.16	1.57
CRC	5	13.13	**0.38**	0.12	0.90	74	74.20	1.00	0.78	1.25	153	136.33	1.12	0.95	1.32	111	97.70	1.14	0.93	1.37
Pancreas	<5	<5	0.87	-	-	23	18.08	1.27	0.81	1.91	31	35.70	0.87	0.59	1.23	19	21.21	0.90	0.54	1.40
NHL	<5	<5	0.41	-	-	12	18.67	0.64	0.33	1.13	52	66.13	0.79	0.59	1.03	47	52.40	0.90	0.66	1.19

†16 Census tracts combined include the 16 San Bernardino County year 2000 Census tracts in the vicinity of the BNSF railyard.

‡ Asian/Other includes Asian, Pacific Islander, and mixed race/ethnic groups and persons not classified in the other race/ethnicity categories. NH signifies non-Hispanic ethnicity, regardless of Black and White designation.

¥Lung signifies cancer originating in the lung and bronchus, CCR signifies colorectal cancer, NHL is non-Hodgkin"s lymphoma, and Nasophx signifies nasopharyngeal carcinoma.

<5 signifies observed or expected counts fewer than 5. The precise numbers are not revealed to preserve the identities and health status for individuals. N/A SIR is undefined and not available because observed count is zero.

Statistically Significant SIRs indicated in bold.

TABLE 2-5. OBSERVED (O) AND EXPECTED (E) COUNTS, AGE-ADJUSTED, RACE/ETHNICITY-COMBINED AND SEX-SPECIFIC AND COMBINED STANDARDIZED INCIDENCE RATIOS (SIRS) WITH 95 PERCENT CONFIDENCE INTERVAL LIMITS (95% CI) FOR SIRS IN HIGH, MODERATE, AND LOW AIR POLLUTION EXPOSURE AREAS OF 16 CENSUS TRACTS IN THE VICINITY OF THE BNSF RAILYARD.

Exposure →	**Railyard High**					**Railyard Moderate**					**Railyard Low**				
	Count		SIR	95% CI		Count		SIR	95% CI		Count		SIR	95% CI	
Cancer Site[¥]	O	E	(O/E)	LL	UL	O	E	(O/E)	LL	UL	O	E	(O/E)	LL	UL
FEMALES															
All Sites	149	135.43	1.10	0.93	1.29	489	738.01	**0.66**	0.61	0.72	934	943.30	0.99	0.93	1.06
Lung	20	11.22	**1.78**	1.09	2.76	52	54.04	0.96	0.72	1.26	98	103.73	0.94	0.77	1.15
Breast	38	39.56	0.96	0.68	1.32	142	148.53	0.96	0.81	1.13	253	287.78	**0.88**	0.77	0.99
CRC	15	13.26	1.13	0.63	1.87	47	55.30	0.85	0.62	1.13	93	101.28	0.92	0.74	1.13
Pancreas	6	3.76	1.60	0.57	3.50	9	14.75	0.61	0.28	1.16	21	26.13	0.80	0.50	1.23
NHL	6	5.88	1.02	0.37	2.24	16	20.57	0.78	0.44	1.27	30	37.50	0.80	0.54	1.14
MALES															
All Sites	132	138.91	0.95	0.80	1.13	545	751.71	**0.73**	0.67	0.79	1,037	953.25	**1.09**	1.02	1.16
Lung	9	14.70	0.61	0.28	1.17	73	68.52	1.07	0.83	1.34	120	120.11	1.00	0.83	1.19
CRC	21	14.60	1.44	0.89	2.20	70	58.54	1.20	0.93	1.51	97	101.03	0.96	0.78	1.17
Prostate	33	42.15	0.78	0.54	1.10	154	179.87	0.86	0.73	1.00	290	308.44	0.94	0.84	1.05
Pancreas	<5	<5	1.24	-	-	17	12.86	1.32	0.77	2.12	18	22.06	0.82	0.48	1.29
NHL	5	6.95	0.72	0.23	1.69	14	23.57	0.59	0.32	1.00	37	41.43	0.89	0.63	1.23
SEXES COMBINED															
All Sites	281	274.35	1.02	0.91	1.15	1,034	1,489.71	**0.69**	0.65	0.74	1,971	1,896.56	1.04	0.99	1.09
Lung	29	25.92	1.12	0.75	1.61	125	122.56	1.02	0.85	1.22	221	223.84	0.99	0.86	1.13
CRC	36	27.85	1.29	0.90	1.79	117	113.84	1.03	0.85	1.23	190	202.31	0.94	0.81	1.08
Pancreas	10	6.98	1.43	0.68	2.65	26	27.61	0.94	0.61	1.38	39	48.19	0.81	0.58	1.11
NHL	11	12.83	0.86	0.43	1.54	30	44.14	**0.68**	0.46	0.97	67	78.92	0.85	0.66	1.08

[¥] All Sites represents all cancer types combined, lung signifies cancer originating in the lung or bronchus, CRC signifies colorectal cancer, NHL is non-Hodgkin"s lymphoma.

<5 signifies observed or expected counts fewer than 5. The precise numbers are not revealed to preserve the identities and health status for individuals.
N/A indicates SIR values that are undefined because of zero observed or expected cell counts.
Statistically Significant SIRs indicated in bold.

Hispanic females showed a significant, moderately higher occurrence of breast cancer than the expected count (SIR = 1.30; 95% CI: 1.06-1.59). Non-Hispanic White females, males and the sexes combined showed higher occurrence than expected for lung and bronchus cancer and for all cancers combined (males and sexes combined). Those elevations were all statistically significant and ranged from SIR = 1.15 (95% CI: 1.08-1.22) for all cancers, both sexes, to SIR = 1.37 (1.10-1.69) for lung and bronchus cancer among Non-Hispanic White males. Observed counts of new cancers among non-Hispanic Black residents of the 16-CT study area surrounding the San Bernardino BNFS facility are similar to the counts expected and are unremarkable. These findings are consistent with lower risk of colorectal cancer reported among Asian/other California residents. The slightly higher than expected occurrence of cancer for all sites combined and for breast cancer among Hispanic residents of the 16-CT area is largely unexplained, and is consistent with the slightly, but not statistically significantly higher occurrence of colorectal cancer among Hispanics.

2.4 Discussion

As early as 1998, following a ten-year review process by the California Office of Environmental Health Hazard Assessment (OEHHA), CARB identified diesel PM as a toxic air contaminant (TAC) under the State's air quality regulatory framework. This classification was based on the potential of this contaminant to cause adverse health consequences, including cancer. Subsequent to this action, there has been mounting concern about the cancer-causing potential of diesel exhaust, particularly based on findings from epidemiological studies in connection with various occupational settings. Concerns were renewed by the publication in 2012 of the results of a large U.S. National Cancer Institute/National Institute for Occupational Safety and Health study of occupational exposure among underground miners in the U.S. The *Miners Study* showed an increased risk of death from lung cancer in workers exposed to diesel exhaust [24]. In the summer of that same year, the WHO's International Agency for Research on Cancer (IARC) classified diesel engine exhaust as Group 1, carcinogenic to humans, based on sufficient evidence that exposure is associated with an increased risk for lung cancer.

The authors of the *Miners Study* stated that their findings are relevant not only for miners but also for millions of workers exposed to diesel exhaust and for urban populations worldwide. In the study, diesel exhaust exposure was represented by respirable elemental carbon (EC). The authors highlighted the high average EC levels (4-12 µg/m^3) reported in several big urban areas in the US, Mexico, Europe, or China as a serious public health threat, concluding that:

> Environmental exposure to average elemental carbon levels in the 2-6 µg/m^3 range over a lifetime as would be experienced in highly polluted cities approximates cumulative exposures experienced by underground miners with low exposures in our study. Because such workers had at least a 50% increased lung cancer risk, our results suggest that the high air concentrations of elemental carbon reported in some urban areas may confer

> increased risk of lung cancer. Thus, if the diesel exhaust/lung cancer relation is causal, the public health burden of the carcinogenicity of inhaled diesel exhaust in workers and in populations of urban areas with high levels of diesel exposure may be substantial.[vi]

EC ambient concentrations exceeding 3 μg/m^3 have been reported for central Los Angeles and for inland locations in the South Coast Air Basin, including Mira Loma and Ontario.[vii] Busy goods movement rail facilities, where diesel-powered trains, trucks, and cargo vehicles operate, are likely to locally increase ambient diesel PM concentrations. In light of the conclusions from the *Miners Study*, the potential for enhanced exposures to diesel exhaust near busy goods movement hubs raises concerns about cancer risk among residents in nearby communities.

The potential for elevated cancer risks near the SBR was the main conclusion of the 2008 HRA conducted following the established risk assessment guidelines developed by the OEHHA under the State's Air Toxics Hot Spots Program (ATHSP). [viii] The results presented in this chapter were generated through a population-based epidemiologic investigation of cancer risk in the same region. The task of interpreting and reconciling the conclusions resulting from both processes can be challenging for non-experts. Further complexities arise in connection to the different perspectives that are frequently held by scientists and outraged citizens as to what constitutes an unacceptable level of risk warranting regulatory action.[ix] Public health regulatory authorities themselves face the difficult task of establishing the rationale for pursuing, or not pursuing, regulatory action based on the available information.

Contextualizing the results and providing clarification about certain technical aspects is needed not only to appropriately interpret the findings from the population-based cancer assessment, but also to build community trust by bringing intelligibility to the process of risk communication. The two modalities of cancer risk assessment, i.e., OEHHA-based[x] *vs*. a population-based epidemiologic investigation, follow different approaches and are intended to answer different questions since epidemiologists and risk assessors differ on how to conceptualize and measure risk. Epidemiologists, for example, focus on estimating risks and investigating causality; thus, an epidemiological approach to investigating railyard exposures would ask the question: what is the risk of

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[vi] Cited from Reference 24.

[vii] The EC concentration for Mira Loma (3.7 μg/m^3) was higher than that observed for Ontario (3.3 μg/m^3) but not as high as the levels measured in central Los Angeles (4.0 μg/m^3), as reported in: O'Kelly JC. South Coast Air Quality Management District Monitoring and Analysis Mira Loma PM10 Monitoring Sampling. Sampling Conducted By Sumner Wilson, Senior Air Quality Instrument Specialist Sample A. January 3, 2001.

[viii] See the 2006 ARB Health Risk Assessment Guidance for Railyard and Intermodal Facilities (available from: http://www.arb.ca.gov/railyard/hra/1107hra_guideline.pdf).

[ix] See the risk communication model (hazard *vs*. outrage) advanced by Peter Sandman (www.psandman.com). For a recent technical evaluation of Sandman's model see: Lachlan K, Spence PR. 2010. Communicating risks: examining hazard and outrage in multiple contexts. Risk Anal. 30(12):1872-86.

[x] Similar to the U.S. EPA risk assessment framework under the Superfund program.

cancer in the presence of exposure to diesel emissions relative to the risk of cancer in the absence of exposure to diesel emissions? The outcome is defined as relative risk (or risk ratio), i.e., the risk in the "exposed" group *divided* by the risk in the referent group (e.g., those outside the railyard impact zone, several miles away from the SBR). In contrast to the epidemiological approach, environmental risk assessors address the question: how many excess cases of cancer will occur in a population of defined size due to exposure to diesel emissions at a concrete dose level? The outcome is exclusively defined as added or excess risk (e.g., 500 excess cancer cases per million persons exposed) and is usually related to a time period (e.g., a lifetime for adults). Added or excess risk is the risk in the "exposed" group *minus* the risk in a referent group. While an epidemiologic investigation produces estimates of disease incidence, the standard OEHHA-based risk assessment does not predict individual exposures or individual health outcomes in the affected communities.

The main concerns prompted by the findings from the HRA for the SBR focused on the high cancer risk that was estimated for the areas surrounding the facility. According to the HRA's projections, at the point of maximum impact (PMI), 3,300 excess new cancers would occur per million persons receiving a (70-year) lifetime exposure—24 hours a day and 7 days a week—to excess air pollutants emitted by the SBRfacility along the north side of the west end of the A yard fence line. For the residential areas, the potential cancer risk for the maximally exposed individual resident (MEIR) was estimated at 2,500 excess cancers per 1,000,000 persons. The MEIR rate corresponds to the estimated risk at the point with the highest air concentration of the cancer-causing chemical. It should be noted that these risk levels represent the potential cancer risks in addition to the regional background risk from diesel PM emissions: 1,000 excess cancers/million.[xi]

The acceptable level for individual cancer risk varies in different Federal and State programs. The U.S. EPA under the Superfund program defines the acceptable risk range for exposure to a carcinogen as 1×10^{-4} (1 in 10,000) to 1×10^{-6} (1 in 1,000,000) excess lifetime cancer risk. Exposures that are projected to cause a number of excess cancers above those benchmarks are considered to be of concern and may require action to reduce the exposure and associated risk. Under California's Hot Spots program, 1×10^{-5} (1 in 100,000) is a common standard for the Air Districts. Thus, the PMI and MEIR estimated for the SBR are 330 and 250 times, respectively, the regulatory acceptable risk level under the State's regulatory framework. Upon the release of the CARB health risk assessment, fears about these high cancer risks spread among residents, and local authorities also voiced concern. Some emphasized that projections of

[xi] For the entire South Coast Air Basin, the estimated background risk level has been estimated at 1,005 excess cancers/1,000,000 caused by all toxic air pollutants in the year 2000, as reported in the Air Resources Boards' 2009 *California Almanac of Emissions and Air Quality*, available from: http://www.arb.ca.gov/aqd/almanac/almanac.htm.

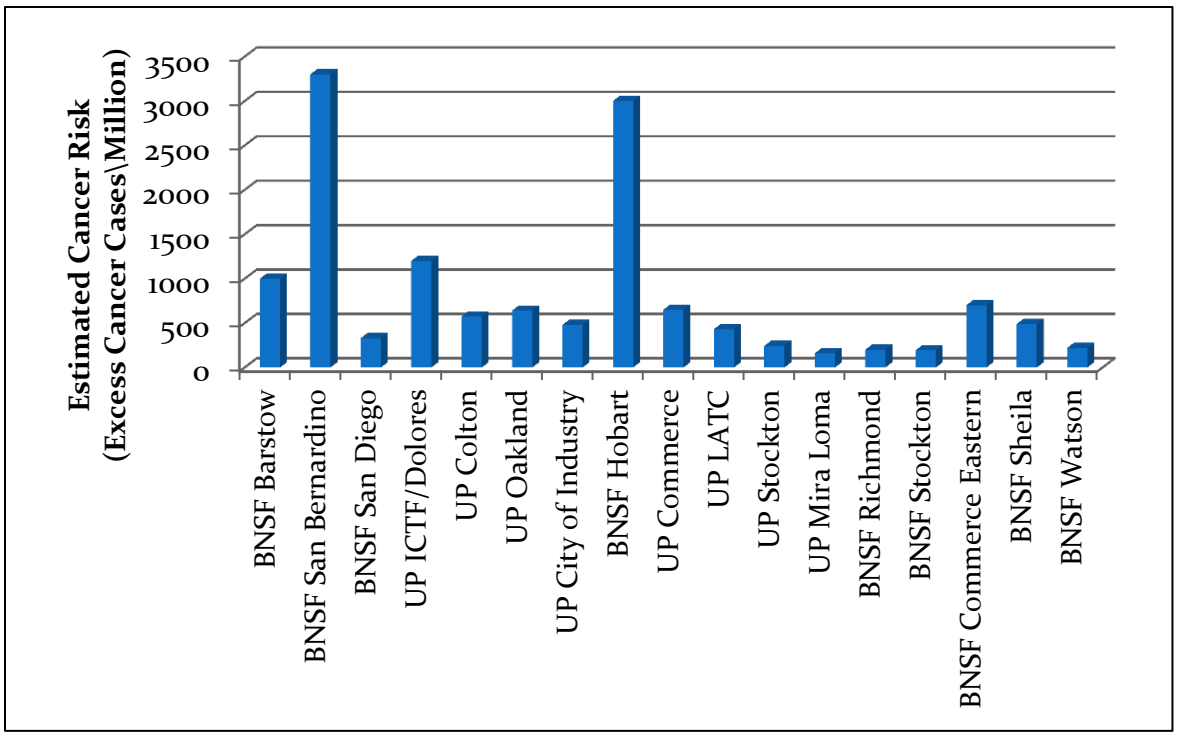

FIGURE 2-2. ESTIMATED EXCESS CANCER RISK AT POINT OF MAXIMUM IMPACT FOR THE DESIGNATED RAILYARDS IN CALIFORNIA UNDER THE STATEWIDE RAILROAD AIR POLLUTION REDUCTION AGREEMENT (SOURCE: CALIFORNIA AIR RESOURCES AIR BOARD'S WEBPAGE, *RAILYARD HEALTH RISK ASSESSMENTS AND MITIGATION MEASURES* HTTP://WWW.ARB.CA.GOV/RAILYARD/HRA/HRA.HTM).

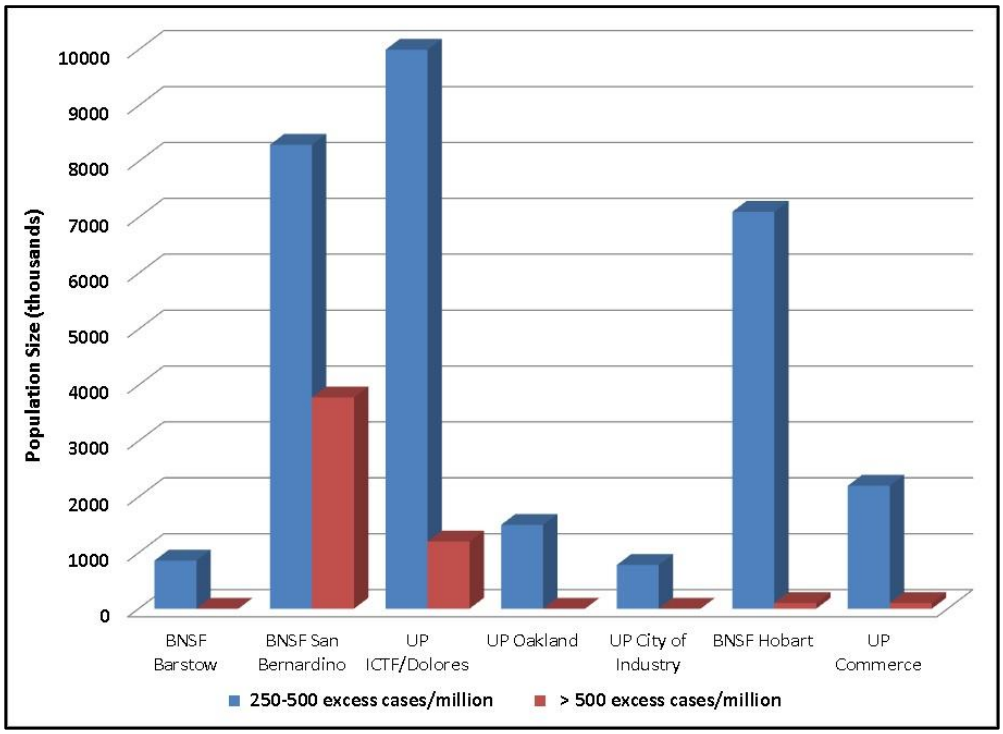

FIGURE 2-3. COMPARISON OF ESTIMATED EXPOSED POPULATIONS ASSOCIATED WITH THE TWO HIGHEST CANCER RISK LEVELS (ASSUMES A 70-YEAR EXPOSURE) PROJECTED FOR SEVEN CALIFORNIA RAILYARDS.

cancer risk within OEHHA's risk assessment framework are conservative by design and subject to statistical uncertainty. Others underscored that the projected risks should not be interpreted as a literal prediction of cancer incidence in the affected communities, and that HRAs are simply a tool for comparing the relative risk between one facility and another.[xii] Yet comparisons with the results from the HRAs for other major California railyards did not diminish but rather intensified concerns among residents, since the SBR ranked first in terms of projected cancer risk among the assessed railyards **(Figure 2-2).**

With the exception of the BNSF Hobart facility, the SBR's PMI risk level amply exceeded (3x to 6x) those estimated for other California railyards**.** It has been noted that the individual cancer risk approach has limitations in terms of protecting public health.[xiii] For example, a railyard with an unacceptable individual cancer risk level located in a sparsely populated area could impact few individuals; while a facility in a densely populated area with a lower individual cancer risk level is technically lower risk but has the potential to expose many more people. The latter can potentially cause more cancer cases than the former and thus have a greater public health impact. For a large facility such as an intermodal railyard with multiple air pollution sources, i.e., train engines, trucks, and other machinery, the risk to the population as a whole is the primary public health concern. *Individual cancer risk* is a poor method of determining impact on a population; therefore, a *population risk* metric is a better measure of determining public health impact.

The OEHHA has proposed the number of residents at a particular cancer risk level (e.g., 1×10^{-6}, 1×10^{-4}, etc.) as a surrogate measure of population burden. This metric can be derived via the number of individuals within the isopleths delineating the specific cancer risk levels. The HRAs conducted under the 2005 SRPRA contained data on the estimated exposed population associated with the various cancer risk levels (assuming a 70-year exposure). These estimates were derived based on the 2000 U.S. Census Bureau's data. **Figure 2-3** shows a comparison across railyards of the estimated populations associated with the two highest cancer risk levels (250-500 and > 500 excess cancers/million) that were estimated for the assessed railyards. For ten railyards, the models predicted that all impacted residential areas were at risk levels between 10 and < 250. Only seven railyards were predicted to have residents above the 250-risk level. With

[xii] The value of HRAs is to be understood within the 'Precautionary Principle' approach, which in some legal systems, as in the law of the European Union, have been made a statutory requirement. As aptly noted by one of the nation's leading environmental epidemiologists: "[W]ithout risk assessment, the default assumption is frequently that of zero risk. 'No risk has been shown' is easily interpreted as 'there is no risk', and risk assessment as a way of thinking can guard against this pitfall." See: Hertz-Picciotto I: Environmental Risk Assessment. In *Introduction to Environmental Epidemiology;* pp 23-38. E.O. Talbott and G.F. Craun (eds). Boca Raton, Florida, CRC Press: 1995.

[xiii] See the discussion on population *vs.* individual risk in chapter 11 of the OEHHA's Technical Support Documentation for Exposure Assessment and Stochastic Analysis, August 2012 (http://www.oehha.org/air/hot_spots/tsd082712.html).

8,300 residents estimated to live in the 250-500 excess cancer risk level, the SBR ranked second for that risk range, behind the UP ICTF/Dolores in Los Angeles.

Only four railyards out of 17 assessed,[xiv] were predicted to have residents at a risk level > 500 in excess cancers/million: UP Commerce (100 persons); BNSF Hobart (100 persons); UP ICTF/Dolores (1,200 persons); and BNSF San Bernardino (3,780 persons). Thus, the SBR ranks first in California both for individual cancer risk (PMI and MEIR) and for population burden measured by the number of people with the highest excess cancer risk levels modeled across railyards. Such high risks, revealed by the railyard-based risk assessments performed under the current State regulatory framework, raise concerns about the potential cancer burden in the communities near the SBR. Thus, in the ENRRICH Project and using data from the CCR, we conducted a non-concurrent cohort study to determine whether an excess in the number of new cancers occurred in the communities near the railyard.

The number of new cancer cases among residents in 16 contiguous CTs surrounding the SBR was evaluated against a standard population: the 4.1 million residents of the four counties which make up Region 5 of the CCR, San Bernardino, Riverside, Mono, and Inyo. Assessments were conducted for all cancer types combined and for specific cancer sites: lung, breast, colorectal, prostate, pancreas, and non-Hodgkin's lymphoma. The patterns of cancer occurrence in the target region need to be interpreted with respect to the hypothesized exposure gradient and in relation to the known differences in cancer incidence among the various race/ethnic groups. According to data reported by the DSCSP for Region 5 and California (**Figure 2-4**), among major racial groups, cancer incidence is highest for African Americans for all cancer sites combined and for most specific cancer types. Cancer incidence among non-Hispanic Whites in the area is higher than that found among Asian Americans and Hispanics.

[xiv] An HRA conducted for the UP Roseville Railyard (Sacramento County) in 2004 prior to the implementation of the SRPRA had estimated that 685 people resided in the > 500 excess cancers/million impact zone (http://www.arb.ca.gov/railyard/hra/hra.htm).

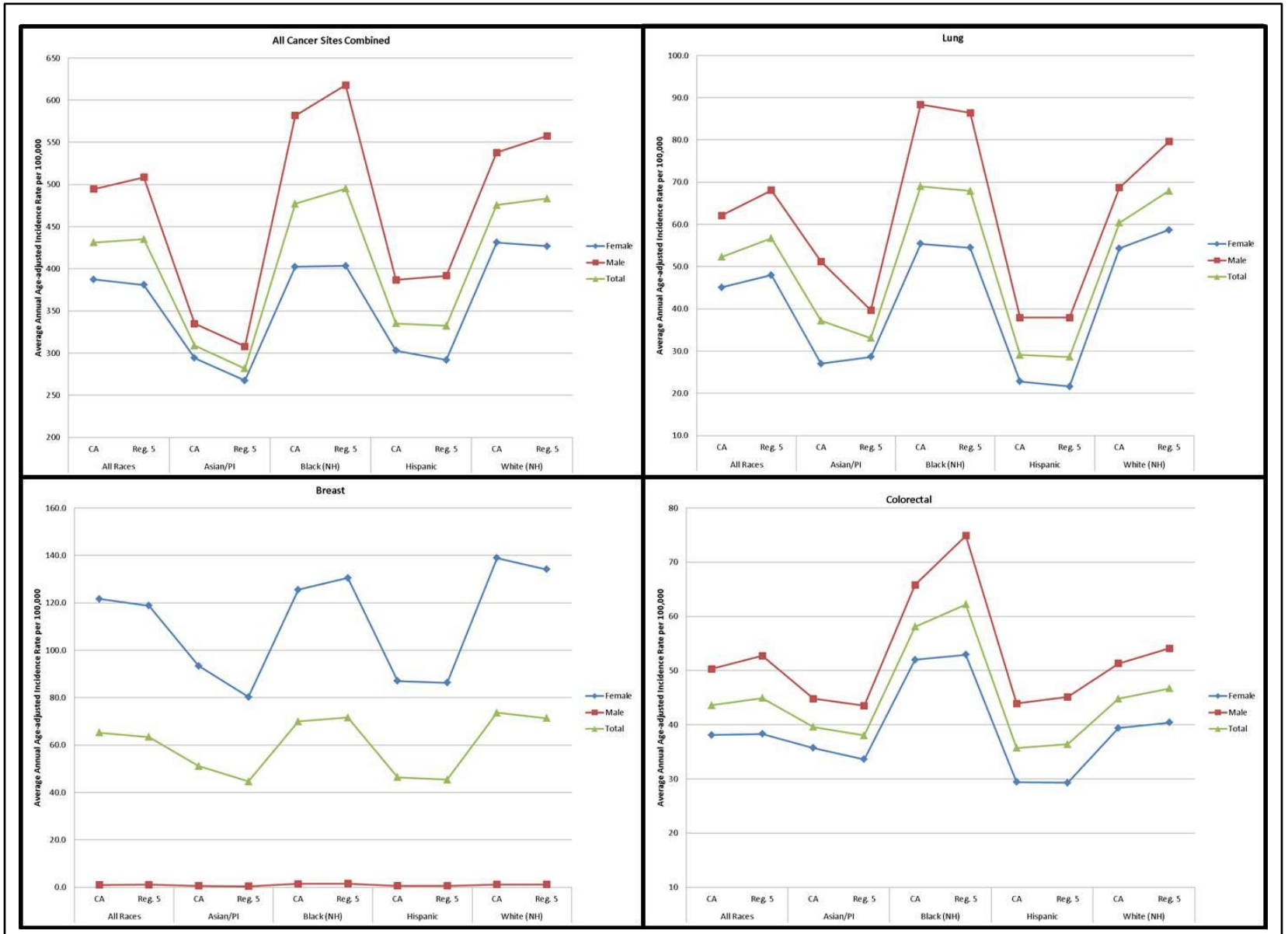

FIGURE 2-4. AVERAGE AGE-ADJUSTED INCIDENCE RATES PER 100,000 BY SEX FOR CALIFORNIA AND REGION 5 OF THE CCR (2004-2008)—INVASIVE CANCER. INCIDENCE RATES ARE PRESENTED FOR ALL CANCER SITES COMBINED AND FOR THREE CANCERS: LUNG, BREAST, AND COLORECTAL.

2.4.1 Key Findings: All Cancers Combined

Our assessments of observed and adjusted expected counts of new cancers among residents in the combined 16-tract region identified: 1) a statistically significant but modest elevation for all cancers, both sexes combined, all race/ethnic groups combined (SIR = 1.10; 95% CI: 1.06-1.13); 2) noticeable statistical elevations among Hispanic (SIR = 1.18; 95% CI: 1.10-1.27) and non-Hispanic White (SIR = 1.23; 95% CI: 1.13-1.34) male residents; 3) lower than expected cancer counts among Asian/other residents (SIR = 0.75; 95% CI: 0.60-0.93); and 4) no clear evidence of a "dose-response" trend across our hypothesized low-moderate-high exposure gradient within the area defined by the 16 contiguous tracts surrounding the SBR. We did not find evidence of risk elevations for non-Hispanic Black residents.

However, it is helpful to put these findings in perspective. For example, by epidemiologic standards, an elevation of 0.10 is regarded as small. Still it is illustrative to consider how such a seemingly small elevation can translate into a high value in terms of excess risk (the metric used in the OEHHA's risk assessment framework). For example, an SIR = 1.10 could translate into 40,760 excess cancers/million if we factor the background lifetime risk of being diagnosed with cancer in the U.S. to be 40.76%.[xv]

Elevated counts of new cancers are seen among females but not among males in the railyard high excess air pollution exposure area, while the reverse effect is seen in the railyard low excess exposure zone. This could be due to the fact that the mainly low-income Hispanic females residing in the area may well spend more time at home than males, who presumably are working away from home in areas with different exposure levels. Failure of these findings to portray an unambiguous pattern with airborne pollutants is underscored by the markedly lower observed cancer counts than the age- and race/ethnicity-adjusted expected numbers for females, males, and sexes combined in the railyard moderate excess exposure zone.

Differences between the SIR findings for all race/ethnic groups combined (race/ethnicity-crude) in **Table 2-2** and those presented in **Table 2-3** for the race/ethnicity-adjusted, railyard exposure combined are a consequence of the mixing of race/ethnic effects in **Table 2-2** and the mixing of the railyard excess exposure level effects in **Table 2-3**. In spite of these limitations, the age-adjusted and race/ethnicity-specific findings presented for females, males, and sexes combined isolate individual race/ethnic effects for the combined railyard excess exposure areas. Similarly, **Table 2-3** findings adjust for age and race/ethnicity, isolating the effects within each of the three railyard excess exposure areas for females, males, and sexes combined. Disparate findings for the race/ethnic groups and between the sexes and contradictory findings for the three excess exposure zones do not provide clear evidence that exposure to airborne emissions from the SBR elevates cancer

[xv] See SEER Lifetime Risk Tables (http://seer.cancer.gov/csr/1975_2010/results_merged/topic_lifetime_risk.pdf). Using SEER's 40.76% lifetime cancer risk in the U.S., we can predict 407,600 cancers to occur in a population of 1,000,000. Then 448,360 cancer cases would be expected to occur under a scenario of a 10% elevation in the risk (SIR = 1.10). The excess number of cancers is 40,760/million (448,360 *minus* 407,600).

occurrence in the surrounding community. That said, some of the observed elevations might be explained by other factors.
It is reasonable to surmise that differences in residency and exposure duration exist for various race/ethnic groups, with recent residents having exposure durations short of the latency period between exposure and increased cancer occurrence. Assuming that the non-Hispanic Black population is largely composed of recent residents of the railyard exposure area could explain the null findings identified in this race/ethnic group. Based on data from our household survey, we have confirmed that there is indeed a higher proportion of long-term residents among the Hispanic and non-Hispanic White populations in the areas surrounding the SBR, compared to the non-Hispanic Black population. We have estimated that while 61% (n = 104) of the African American participants report residing at their current address < 5 years, this proportion decreases to 40% (n = 101) among White participants and 52% (n = 711) among Hispanics. We have also estimated from our ENRRICH household survey that 40% of White respondents report having lived at their current address ≥ 11 years, while this same proportion is 26% and 22% among Hispanic and Black residents, respectively. Our ENRRICH population sample included few observations for Asian households and therefore it was difficult to calculate reliable proportions. Short residential history could only explain the markedly lower observed count of new cancers measured among Asian/other residents of the railyard exposure area, compared to the adjusted expected number if a substantial fraction of this race/ethnic group migrated from areas having markedly lower cancer occurrence than the DSCSP.

Differences in tobacco use between race/ethnic groups could, at least partly, explain the markedly higher cancer occurrence among non-Hispanic White males. Tobacco use has traditionally been highest among lower socioeconomic status White males. Nevertheless, this interpretation is challenged by the absence of any excess in observed-to-expected cancer counts among non-Hispanic Black males, who also reside in low SES Census tracts and represent the second highest or highest tobacco use among major race/ethnic groups nationally and in the State.

Patterns of smoking prevalence also would not seem to explain either the elevated cancer risk found among Hispanics or their overall cancer incidence rates compared to other groups in California or in Region 5. Only Asian/Pacific Islanders (8.1%) have lower smoking prevalence in California than Hispanics (10.2%).[xvi] A similar trend exists for these two groups with respect to overall cancer incidence (see **Figure 2-4**). Altogether, findings for higher than expected observed counts for new cancers among Hispanic females and males may provide the strongest evidence that excess air pollution emissions from the SBR could contribute to an excess in observed cancer counts.

The lack of clear evidence for higher occurrence of cancer across the exposure range (low-moderate-high) defined in our assessment requires additional commentary. Under a scenario of a sharp gradient in the dispersion of emissions away from the railyard, it would be reasonable to predict an accompanying marked elevation in cancer risk moving from the

[xvi] Smoking prevalence statistics for California by can be found at: Al-Delaimy WK, White MM, Mills AL, Pierce JP, Emory K, Boman M, Smith J, Edland S. Final Summary Report of: Two Decades of the California Tobacco Control Program: California Tobacco Survey, 1990-2008, La Jolla, CA: University of California, San Diego; 2010.

low to the high exposure zones. Not seeing clear evidence of a dose-response trend needs to be understood in light of the spatial configuration of the risk ranges used in defining our low, moderate, and high exposures (**Figures 1-2** and **2-1**). Those risk ranges intersect with the boundaries of the census tracts (CTs). As can be seen in **Figure 2-5,** every tract contains a complex combination of multiple exposure risk ranges. Our approach relied on "averaging" exposure across each tract (see Section 2.2). Even though the averaging was area-adjusted, our approach may have oversimplified the within-tract, short-scale spatial variation. In other words, using CTs as the geographic unit of analysis may not afford the adequate, fine spatial resolution to model the natural, short-scale air pollution gradients, a limitation that can potentially result in exposure misclassification. Non-differential misclassification of exposure is likely to bias towards the null. These results may in fact be misleading, since this exposure classification method is likely to show a lower or even non-existent association. The possibility also exists that diesel emissions disperse according to a more gentle gradient than anticipated within the spatially compact (approximately 9,500 acres) 16-tract region, located in relative close proximity to the SBR—within a 2.5-mile radius (see **Figure 2-5**). Therefore, we cannot exclude the

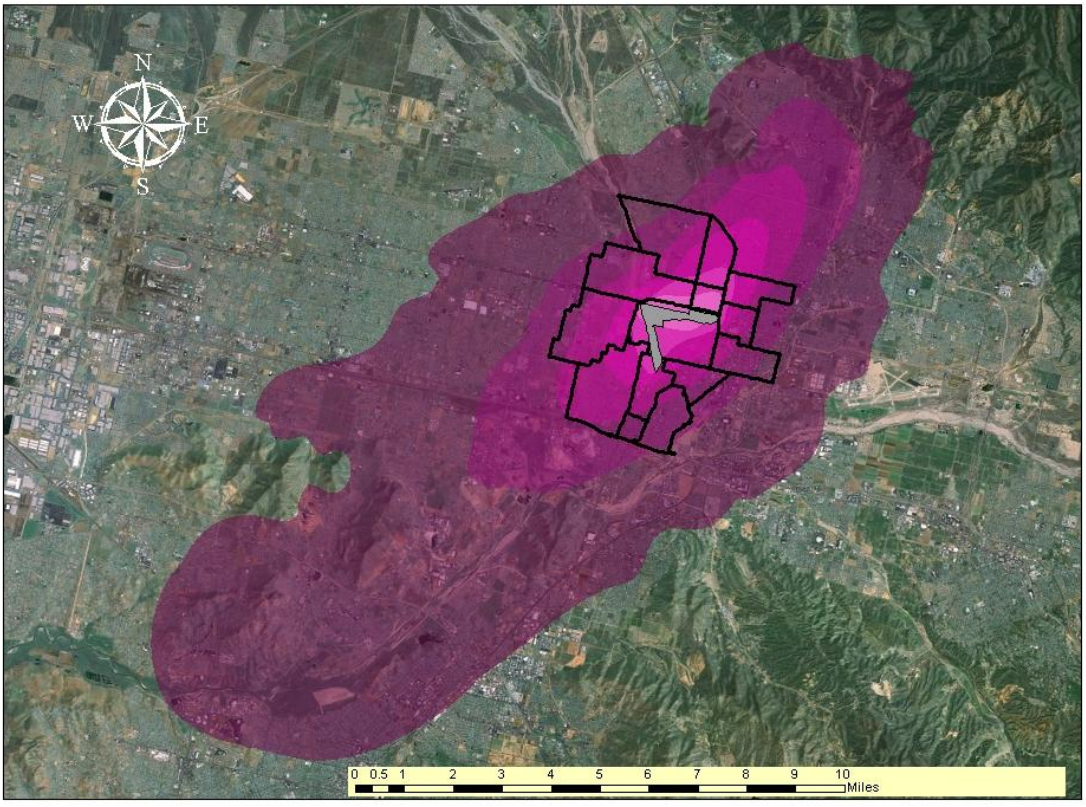

FIGURE 2-5. MAP OF THE SAN BERNARDINO RAILYARD AND ITS RISK IMPACT ZONES IN RELATION TO THE BOUNDARIES OF THE CENSUS TRACTS ON WHICH THE POPULATION-BASED CANCER ASSESSMENT WAS BASED. THE IMPACT ZONES CORRESPOND TO THE CANCER RISK RANGES PREDICTED BY THE AIR DISPERSION MODELS USED IN THE CALIFORNIA AIR RESOURCES BOARD HEALTH RISK ASSESSMENT. CANCER RISK DECREASES AS DISTANCE FROM THE RAILYARD INCREASES.

possibility that not having found a clear “dose-response” pattern was in part due to a methodological limitation in correctly modeling the actual air pollution gradient and the exposures assigned to the populations in the CTs immediately surrounding the SBR. This issue warrants further investigation.

2.4.2 Key Findings: Cancer Site-Specific

We also conducted site-specific analyses that distinguish findings for combined and dose-related railyard emission exposures for specific cancer types having different etiologic mechanisms. Next we summarized the key findings from these analyses according to the railyard exposure gradient and by major race/ethnicity groups for all 16 CTs combined.

2.4.2.1 Railyard Exposure Gradient

Although no clear evidence was found of sex-specific dose-response trends across the high-moderate-low gradient, some elevations were observed for residents in the high-exposure CTs: (1) a statistical excess of lung/bronchus cancer (SIR = 1.78; 95% CI: 1.09-2.76) among females; and (2) non-significant elevations for colon/rectum and pancreas cancers among females and males. Finding a statistically significant elevation of 78% of lung/bronchus cancer among female residents in our high exposure region near the SBR was puzzling given the lower than expected count for the same cancer among male residents and null findings among residents of the moderate and low exposure areas. However, when the data for both sexes are combined, there seems to be a pattern of non-significant but rising SIRs appears across the low-moderate-high exposure gradient for lung, colon/rectum and pancreas, suggestive of a dose-response trend (see **Table 2-5**).

2.4.2.2 Census-Tract Study Area by Sex and Ethnicity

Hispanic: Most noticeably, females showed a significant, higher occurrence of breast cancer than expected (SIR = 1.30; 95% CI: 1.06-1.59). Statistically significant elevations for females were also found for all combined cancer sites (SIR = 1.09; 95% CI: 1.01-1.17), males (SIR = 1.18; 95% CI: 1.10-1.27) and sexes combined (SIR = 1.13; 95% CI: 1.08-1.19), for all cancers combined. These risk elevations for all combined sites and for breast cancer among Hispanic residents is largely unexplained, and is consistent with the slightly higher occurrence, approaching statistical significance, of colorectal cancer among Hispanics (both sexes). Given the strong association between past tobacco use and lung and bronchus cancer occurrence, we explored past tobacco use and smoking prevalence in our ENRRICH female respondents. We used the household survey, which included questions on tobacco use, to explore smoking prevalence among our female respondents in sampling areas A and B, roughly corresponding to the high-exposure CTs, and medium and low exposure CTs, respectively, (see **Figure 2-1**). Past tobacco use among Hispanic female participants in sampling region A (high railyard exposure) was 13.8% (n = 138) compared to 13.1% (n = 175) in region B (medium-low railyard exposure). Among all female participants in the ENRRICH study, those figures were 16.7% (n = 162) and 22.9% (n = 240), respectively. Current smoking prevalence among Hispanic women was lower in the medium-low exposure CTs, 5.7% (n = 174) compared to that estimated for them in the high exposure zone: 7.2% (n = 139). To place in context, 8.4% of women in California

smoke, while smoking prevalence among Hispanic women is 5.3%.[xvii] Thus we found that Hispanic females had the lowest tobacco use rates, not lending support to smoking as a causative agent. Also, it is reasonable to argue that female residents in the high-exposure region could have greater exposure to diesel emissions than males, if one assumes that males are more likely to work outside of the area while females are more likely than males to work at home.

Non-Hispanic White. Females showed elevations of lung/bronchus cancer; males for lung/bronchus cancer and for all cancers combined; and the combined sexes for all sites and lung/bronchus. Those elevations were all statistically significant and ranged from 1.15 (all cancers-both sexes) to 1.37 (lung/bronchus cancer among males). These findings reveal that female excess occurrence of lung/bronchus cancer in the railyard high region is substantially limited to non-Hispanic White residents. This group is characterized by greater than average past tobacco use.

Non-Hispanic Black. Observed counts of new cancers were similar to the expected counts and are unremarkable.

Asian/Other. Slightly fewer than expected counts for all cancer sites combined were observed among females and for both sexes combined and markedly lower than expected counts of colorectal cancer. These results are based on small numbers of counts but are consistent with lower risk of colorectal cancer reported among Asian/other California residents.

2.4.3 Limitations

The multifactorial character, different etiologies, and variable latency periods for different cancers challenge the value of using all cancer types combined as a biologically meaningful measure of the consequence of air pollution. In addition to this limitation, our findings might also be confounded by differences in presence, level, and duration of tobacco use between the sexes, race/ethnic groups, and income, education, and cultural subgroups that likely exist in the railyard exposure areas and the standard population. Although we have incorporated in our discussion estimates from the overall ENRRICH household survey, the impact of different tobacco use patterns in demographically unique segments of the population surrounding the SBR facility was not specifically assessed in this cancer investigation and is likely partly responsible for findings that appear to defy a common etiologic pattern. However, we believe that the cancer risk elevations found for Hispanic females are not easily explained by tobacco use rates alone.

A number of known factors may influence the susceptibility of the population and thus may impact population risk.[xviii] For example, socioeconomic status can be linked to psychosocial stress, influence access to health services and healthy food, or even outcomes after cancer diagnosis. Data from the ENRRICH household survey revealed that joblessness is a serious concern in the low-income communities surrounding the SBR.

[xvii] *Ibid.*

[xviii] For a discussion of factors that can affect the vulnerability of the population see OEHHA's excellent report *Cumulative Impacts Building a Scientific Foundation* (available at: http://oehha.ca.gov/ej/cipa123110.html).

Community unemployment itself can affect exposure and residency time near the railyard facility. OEHHA recommends that these types of factors be considered in the risk assessment process. Similarly, access to and utilization of cancer early detection (screening) resources likely accounts for some of the variation in occurrence and detection of the most common cancer types and was not directly assessed in our study. In addition to these limitations, our investigation did not include information on previous residence history or duration of residence in the study area or the standard population, although we have provided in this discussion some estimates of residence length, again based on the ENRRICH household survey.

Other health outcomes included in the ENRRICH project may provide more biologically meaningful and important evidence of health consequences of air pollution attributed to the BNSF facility. Further analyses that formally evaluate observed and expected counts of specific cancer subtypes that may be differentially associated with air pollution and diesel emissions, tobacco use, poverty, and differential cancer screening practices are warranted. Cancer is not an early warning marker for environmental problems. Perhaps because of long latency periods, dynamic population characteristics, complex etiologic pathways and measurement errors, environmental exposures that are reasonably deemed to be harmful are frequently never associated with unusually higher than expected cancer occurrence [69].

CHAPTER 3. COMMUNITY BASED PARTICIPATORY RESEARCH (CBPR) STRATEGY AND ADULT HOUSEHOLD HEALTH ASSESSMENT

3.1 Community Engagement Approach

The aim of the community engagement component of the ENRRICH Project was to develop an informed community response, including moving toward policy changes to reduce railyard exposures and related health impacts. In this chapter, we describe our overall CBPR strategy, including portions that have been detailed in academic publications by the ENNRICH Project team. We also present in this chapter the results from the household-level public health assessment sub-study, which was underpinned by the Project's community engagement framework and activities.

3.1.1 Contextual Framework and CBPR Strategy

When findings from the CARB's HRA Report became more widely known, local community groups raised concerns regarding air quality and its effect on residents, and challenged the Mayor of San Bernardino, local politicians, the media and researchers to look more closely at this issue. In response, community-based organizations including our partner, the Center for Community Action and Environmental Justice, with assistance from the City of San Bernardino, helped form action committees and organized informational community meetings. While many in the affected community had concerns about the impact of pollution on their health, there was also a general lack of trust in official entities, including government and research institutions such as LLU, to take appropriate action. Some residents feel that scientific studies rarely, if ever, benefit the individuals or communities being studied, which affects the community's willingness to participate in research. Compounding the situation, the high percentage of monolingual Spanish speakers in the area and resulting language barriers made discussing concerns about environmental justice and the health impacts of goods movement difficult – but these discussions were vital to soliciting community support and participation. For example, while economists refer to these goods movement health impacts simply as "externalities" of transport, residents near railyard facilities fear that these "externalities" directly harm them and affect their health and quality of life [6] —a suspicion they see as corroborated by CARB's HRA Report. As one local resident recently pleaded: "…if they know they are polluting and they're hurting people, they should do something!"

It is for this reason we decided to conduct the ENNRICH study using a collaborative approach known as community based participatory research (CBPR). CBPR is a co-learning and empowering process that involves community members in all phases of research, including identifying issues, collecting and analyzing data, developing assessment tools, designing and implementing interventions, and disseminating findings [71]. We argue that CBPR is a logical and necessary methodology to bring together the community, its stakeholders, and local researchers in a true partnership. This approach helps build trust and confidence between community and scientists by working together to collect exposure and disease outcome data. Providing the community with the tools and education to better understand study findings further strengthens that trust. CBPR is an increasingly widely used research approach in studies that involve investigating community

concerns involving hard-to-reach or access communities and has shown great promise as a research tool to address EH disparities and advance EH science [72].

With CBPR principles serving as the platform to begin the research and engage community, we developed a partnership with an Inland Empire community based agency, the Center for Community and Environmental Justice (CCAEJ), which is well known in the area for its work on local issues, including environmental justice and air quality. As a team, LLU researchers have a long track record in using CBPR and other community involved research approaches in the target community in areas such as disaster preparedness, health disparities, teen pregnancy prevention, and prostate and breast cancer prevention.

3.1.2 Community-based Research Partnership

As noted earlier, our community partner for this study is the Center for Community Action and Environmental Justice (CCAEJ), a non-profit environmental justice organization whose focus is bringing people together for cooperation and participatory decision-making to improve their social and natural environment. CCAEJ's practice is to help individuals recognize their own strengths, learn new skills, and develop the confidence to use them, believing that building community capacity is crucial to long-term sustainability. For example, two of the 11 staff members who participated in the project are residents of the Westside of the City of San Bernardino and live next to the BNSF SBR railyard.

The organization has worked in San Bernardino's Westside neighborhood for more than 6 years on various environmental issues and has a membership of 400 in that community. At the time the ENRRICH study began, residents had already formed a Community Action Team (CAT) made up of 30 families that follow the day-to-day activities of the group on the railyard issue. They meet bi-monthly in a multi-agency Task Force working to reduce neighborhood exposure to the railyard emissions.

As part of data collection under the ENRRICH Project, CRPs teams were also involved in community translational and action work. They participated in local and other task force meetings and were members of action sub-committees the target community. This type of active engagement by non-academicians was appreciated by the community, which helped make our interviewing tasks, while still challenging, successful.

Some have questioned the wisdom of collaborating with a local community partner on data collection for this important health outcomes study. As investigators, we made a conscious decision to adopt a true CBPR approach and therefore to work in collaboration with community *vs*. using a traditional top-down model of investigator-driven data collection, which some would suggest would have provided for more rigor and control. We would argue however, that the scrupulous, detailed training, supervision and quality control in our partnership allowed us the best of both worlds: implementing a rigorous study in collaboration with the community that access to a usually highly closed community that otherwise likely would not have participated to the same degree due to trust concerns. Community-based research partners (CRPs) received the extensive training necessary to collect study data. First and foremost, to ground the community researchers in the basic tenets of human research and to comply with LLU Institutional Review Board (IRB) requirements, all CRPs involved in data collection were trained and certified in the ethical

conduct of human subjects (HS) research before data collection began. The CRPs also received lengthy training on the study protocol and how to properly collect study data. After the CRPs were trained in data collection techniques and protocols, the teams were supervised and systematically joined by LLU researchers to observe and participate in data collection. Regular weekly meetings were held with the CRP teams to discuss study progress.

3.1.3 Human Subjects Research Training with Community Members

CBPR has evolved as a valid approach that is seen as effective in advancing research objectives while at the same time partnering with community to seek solutions to health disparities issues. CBPR involves community members in all phases of research, including identifying issues, collecting and analyzing data, developing assessment tools, designing and implementing interventions, and disseminating findings.

To ensure high quality implementation of study procedures and comply with Institutional Review Board (IRB) requirements, all participants involved with the ENRRICH study needed to be trained and certified in the ethical conduct of human subjects (HS) research. Early in this process, we realized that the conventional NIH-IRB certification methods used at LLU, which are designed for university scientists, are not well suited for community members who often face educational as well as language barriers. In response, we worked with our LLU leadership and our community partners to develop a community friendly human subjects training curriculum that met the requirements of our IRB and at the same time was well-suited to our community partners from CCAEJ, comprised mainly of monolingual Spanish speakers with varying educational backgrounds. We have drafted a manuscript of our findings and experiences, which have been accepted for publication in the journal: *Progress in Community Health Partnerships: Research, Education, Action.* The manuscript is included below. The purpose of this article was to share the experiences and lessons learned in developing and implementing a customized human subject research curriculum for our community partner, which was community friendly yet still rigorous and fulfilling our Institutional Review Board requirements.

Making Human Subject Protection Training Community Responsive: Experiences Delivering on the CBPR Promise

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Submitted to

Progress in Community Health Partnerships: Research, Education, Action.

ABSTRACT

Background: A community-based-participatory-research (CBPR) approach was used by the California-based ENRRICH Study, a partnership between scientists from Loma Linda University (LLU) and a local community organization, with the aim of assessing the health effects of exposure to emissions from a railyard on a community. **Methods/Results:** To allow meaningful community participation in all study activities and to comply with Institutional Review Board (IRB) requirements, all participants involved needed to be properly trained and certified in the ethical conduct of human subjects (HS) research. Existing IRB training materials and the conventional certification methods designed for university scientists are not well suited for community members who often face educational as well as language barriers. **Conclusion:** The purpose of this article is to share experiences in developing and implementing a customized human subject research curriculum, which was community-responsive and addressed IRB requirements.

Key Words: Community-based participatory research, collaboration, IRB, human research

GRANT INFORMATION

This research was in part funded by the South Coast Air Quality Management District (SCAQMD)/BP West Coast Products Oversight Committee, LLC grant # 659005.

COMPETING INTERESTS

The authors have not published or submitted any related papers from this same study. The authors have no financial conflict of interest.

Background

Over the past few years, Community-based Participatory Research (CBPR) has shown promise as a powerful research tool in understanding and addressing persistent health disparities, while empowering vulnerable communities, especially in areas challenged by environmental justice (EJ) concerns[72-75]. Emerging evidence indicates that close residential proximity to environmental hazards results in enhanced exposures, potentially contributing to a greater community burden of disease, subsequently furthering the great health disparity divide [76-78]. EJ communities typically comprise disadvantaged and underserved populations. Compared to the general population, these residents are more likely to be exposed to multiple environmental hazards and social stressors, including poverty, poor housing quality, and social inequality [79]. The cumulative impacts of environmental exposures and social vulnerability are likely to result in greater risk for adverse health outcomes [77, 80-83]. Funding agencies have increasingly called for research to understand both the complex environmental exposures and their possible associations with adverse health effects, with many encouraging researchers to adopt CBPR approaches focused on promoting translation of research findings into sustainable positive changes in the communities most affected [84]. As a result, CBPR has increasingly emerged as an important scientific framework for environmentally related health disparities research at institutions across the U.S. Concurrently, internal institutional challenges have also increased, which at times may prevent, delay, or disrupt collaboration with community partners, such as community-based organizations (CBOs), for CBPR purposes [85-88]. Building on the previously reported IRB challenges, this manuscript highlights the difficulty of using the human subjects (HS) training curriculum required of researchers, and describes the solution for training our community partners with an educational curriculum originally designed for university personnel.

In addition to their responsibility for the approval, modification, ongoing review, suspension or termination of research involving human participants, IRBs are tasked with ensuring that investigators are trained and certified in the ethical conduct of human subjects' research. The HS training emphasizes the conduct of respectful and ethical procedures when working with humans in research, promoting the three fundamental ethical principles of the Belmont Report which include: respect for person, beneficence,

and justice [89]. The principle of respect for persons includes autonomy and informed voluntary consent; the principle of beneficence involves maximizing the benefit to subjects while minimizing risk; and the principle of justice involves equitable distribution of the costs and benefits for potential participants in the research study. The development of the Belmont Report arose directly from the need to protect the rights and welfare of human subjects involved in research studies. Federal funding agencies (NIH, CDC, EPA, etc.) require human subjects training certification for all personnel involved in direct contact with participating human subjects. For research funded by non-federal sources or where the funder does not specify, the HS training requirement may be left up to the discretion of the university.

When conducting CBPR, universities may want to include all team members, including their community partner in the HS training program, to set a strong foundation for research guided by the Belmont principles. A true CBPR approach involves community members in all phases of research, if possible, even from the development of the initial research idea through data collection, analysis and result dissemination [90]. Therefore collaborating community partners should be considered a part of the research staff, and if the funder or university requires HS trainings of full-time researchers, then the training requirement should also pertain to community partners depending on their roles within the research project. Regardless of the requirement, it is helpful to encourage all personnel, whether professional researchers or community partners, to receive the HS training as a means of promoting an environment of ethical and responsible human subjects research. The difficulty of providing HS training for the community partner lies in the HS training curriculum itself. LLU has chosen the web-based training and certification program provided by the Collaborative Institutional Training Initiative (CITI). Though this training and certification should extend to community members and organizations partnering on research projects, using training materials designed for university personnel can be problematic for community members who may come from a variety of educational backgrounds. It is critical that when partnering with local community members that universities not only ensure that everyone is IRB certified and understand the ethical foundation for conducting human research, but do so in ways that are community responsive and promote true awareness for the protection of human subjects. Few resources exist in providing information on developing and delivering community-friendly HS courses [91, 92]. Having limited information available on community friendly and responsive HS training curricula for community partners becomes not only a barrier to the research partnership, but may also be seen as an indicator that preparing CBO partners in the ethical conduct of human subjects research is not viewed as important and essential.

Through our experience with CBPR at Loma Linda University (LLU), we have become increasingly aware of the difficulties in training community partners utilizing a university-targeted HS curriculum. In an effort to increase awareness and protection for human subjects, our university promotes and encourages HS training of all personnel involved with research, including community partners, regardless of any requirements of the funder. Recently, LLU received extramural funding to partner with community members and city agencies to conduct research on the health status of several thousand people

living near a bustling railyard facility in San Bernardino. Successful solutions for exposure mitigation require data specific to the at risk populations and generated through research which is responsive to, and inclusive of, community-identified needs. Subsequently, we created the Environmental Railyard Research (ENRRICH) Project and partnered with local community partners to gather health data and formulate an action plan aimed at promoting cleaner air for community residents living near the railyard. Early into our partnership, it became clear that the conventional HS training and certification methods designed for university personnel are not well suited for community members who often face educational as well as language barriers. The purpose of this article is to share experiences and lessons learned in developing and implementing a customized human subject research curriculum which was rigorous yet community responsive, addressed IRB requirements, and met the needs of our mainly monolingual Latino community team members.

Development of the Overall Training Program

From the onset of our research partnership, both our LLU research team and members of our community partner organization (CP) labored under many assumptions regarding the university-based HS training and certification -- one of which was that only the LLU researchers needed to complete the HS training and obtain certification. Shortly into the IRB approval process we realized the need for *everyone* to complete the training, including CP staff and especially their personnel involved with research data collection. Both organizations expressed interest and the desire to have all Project ENRRICH research team members trained, but the challenge was how to adapt the university training for a community audience. What we had unknowingly stumbled upon was that the actual HS exam itself had become a barrier to the LLU-CP partnership. Even for somewhat experienced researchers, the basic HS web-based training and exam, while available in Spanish and English, can take several hours to complete. For community members who are not familiar with research language and who may lack computer skills, the training course can take significantly longer; it was possible that the CP staff may not pass the exam, which would have prevented them from working on this particular research project; thus the HS exam would have unintentionally created a barrier for partnering with the CBO.

After realizing the need for a HS training curriculum targeted to a lay audience with differing levels of formal education, we began to formulate an initial training plan in partnership with our university's IRB administration and our community partner. We began by discussing important barriers, with a goal of developing solutions (Table 1). We convened a meeting where we discussed potential barriers with our CP, gaining a better understanding of their needs as well as their available resources. One of the first challenges addressed was to ensure that the community partner had the resources (i.e. computers, internet access) necessary to carry out the training. We also recognized the potential language barrier, given that the majority of our CP members were primarily fluent in Spanish. Additionally we recognized the potential difficulty for some of the CP members in understanding research-specific language, whether in English or Spanish, utilized within the HS web-based training and exam program.

Early in the project planning process, LLU researchers met with administrators of our community partner organization to discuss the HS curriculum and how to conduct the training and certification exam. Realizing the complexity of the task, the Director of LLU's Research Protection Programs (RPP) in the Office of Research Affairs, which provides administrative support for LLU's Institutional Review Board (IRB), agreed in theory to provide the training. A meeting was arranged to meet with leaders from both LLU and our CP to discuss the details. During the meeting with the RPP Director (who also serves as IRB Administrator), the CP Program Coordinator laid out how she envisioned the HS training for their members. One concern was that many of the CP personnel were monolingual Spanish speakers, making it necessary for both the training presentation and materials to be translated into Spanish. Conducting the training in Spanish would require a Spanish translator with the IRB Administrator presenting in English. The discussion turned to whether this process in itself lacked a spirit of respect toward the non-English speaking volunteers. We ultimately agreed on an innovative, more community friendly HS training, featuring our project's bilingual Spanish speaking staff. The first step was for the IRB Administrator to provide a specialized training for the designated bilingual staff. The content addressed key points from the standard "IRB 101" lecture, along with an on-going dialog as to what points needed to be emphasized for the lay volunteers working in the field. After some brainstorming, the idea emerged to depart from the standard lecture format or on-line reading/testing and provide a less formal orientation in which "what-would-you-do" scenarios would be discussed and study-specific ethical guidance provided. Three bilingual Spanish/English speaking ENRRICH team members (two researchers from LLU and the Program Coordinator from our CP) would provide the actual community HS training. A training-the-trainers curriculum was developed, with the CP's Program Coordinator leading out to ensure appropriate content of the effort. The HS training sessions would be part of the orientation on safety and security of the community volunteers.

Development of Training Materials

The IRB Administrator provided an existing HS PowerPoint presentation that had been developed for trainings specific for LLU research personnel campus-wide. Together LLU and our CP research team members revised the existing presentation into material that was culturally and linguistically appropriate for the group, providing definitions of research terms (CBPR, human subjects, informed consent), explaining the science behind air pollution and health as it related to the project, and illustrating ethical principles with real-world scenarios team members were likely to encounter in the field. For this particular partnership, the CP Program Coordinator offered and was able to take the lead in adapting the IRB presentation for their team. Members of the LLU research team provided support to the CP Coordinator in assisting with development of the community training presentation. The overall CP training presentation was developed with the idea to make a slide show that was easy to read and understand. We used text font and colors that were easier to read and made sure to reduce the amount of words on any one slide. Table 2 includes a comparison of the similarities and differences between the content covered in the IRB and the CP presentations.

The final presentation developed for the CP was similar to the IRB training in the overall length of the presentation as well as the coverage of specific topics including: defining human subjects, previous historical events (i.e., Nazi war crimes), and research ethics (respect, beneficence and justice). However, the CP presentation differed from the existing IRB presentation on a number of points. The opening slide of the CP presentation focused on describing their CP organization's mission statement and how involvement in the research study supports their mission. The original IRB presentation opened with a description of the role of an institutional review board. After the introductory slide, the CP presentation included a slide of their main goals for the day: 1) getting to know each other better, 2) building on their existing skills and 3) understanding the basic principles of research. Next, the CP presentation included a brief background description of the research projects their organization was currently involved with and their purpose on each of these research projects. Additionally the CP training differed from the IRB training with a greater emphasis placed on the informed consent process. The IRB training had fewer slides on the informed consent process than the CP and more emphasis on the IRB review process, including: how to submit applications to IRB, deadlines for submissions, different types of IRB review (exempt, expedited, and full board review). One of the major differences between the IRB and the CP training was the inclusion of slides inviting the audience to apply the ethical principles of research through role playing potential "real world" scenarios they could encounter during data collection.

The final HS PowerPoint presentation, available in both English and Spanish, was then submitted to and approved by the IRB. The research team met with the IRB Administrator twice more to discuss the logistics of the training, finalize the agenda, and go over all relevant details. Additional training materials included: presentation handouts, study protocols, consent forms, descriptions of the role playing scenarios, role playing evaluation rubric checklist, an agenda as well as a sign in sheet. Overall it took approximately one month for all the training materials to be developed and for the specifics of the training agenda to be defined. The IRB Administrator, the CP Program Coordinator, and the LLU research team members were all in agreement and felt comfortable with the final HS training program materials and the agenda.

Convening the Community Training

Once the training materials had been created and approved by the IRB Administrator, plans were made and dates confirmed to provide the HS training at the CP's headquarters. The training took one half day to complete (approximately 4 hours). A total of 20 of our CP employees were trained and the entire training took place in Spanish to accommodate the primary spoken language of our CP; simultaneous English language translation was also provided. A CP translator with a headset and microphone translated the training into English for the one community member that spoke only English as well as for the LLU research members who were present. Both the LLU and the CP team members participated in providing the training. Figure 1 includes the agenda for the HS training day. Training began with ice breakers, transitioning into introductions and an overview of the day's agenda. Background on the overall research project, project goals, and research methods were described.

After discussion of the background on the research study, the training moved into presentation and discussion of the core ethical principles (respect, beneficence and justice) of conducting ethical research with human subjects. The CP Program Coordinator presented most of the information on the background as well as on the core ethical principles. The LLU team members focused on describing the current research studies that both the CP and LLU were collaboratively working together. Additionally LLU team members presented information on potential real world scenarios that the CP team members could encounter. The community members were asked to role play real-life situations that could occur while collecting data and to apply the core ethical principles. Examples of role playing scenarios included: approaching a potential participant and describing the research study, obtaining informed consent, and applying the core principles to data collection procedures for participating subjects. After role playing, the presenters continued with the PowerPoint slideshow and a more detailed discussion of the informed consent process and the related informed consent documents. Important emphasis was placed on accurately describing the study to potential participants and active discussions as well as hands-on practice, with an emphasis on working as objective researchers. The CP members were encouraged to actively discuss the informed consent process and how the core ethical principles can be applied, then invited to role-play potential real life scenarios in obtaining informed consent from study participants. Our CP Program Coordinator further enriched the training by adding issues related to security and how to best present oneself in the community.

In conclusion of the training day, the presenters provided a recap of the major points to remember and conducted a question and answer session. Both the CP Program Coordinator and the LLU team members responded to questions from the community members. Throughout the entire training process, breaks were frequently encouraged so that all personnel present could get up and stretch and be better able to focus on the material presented. Refreshments were provided, which helped to create a friendly and relaxed learning environment. A sign in sheet was collected and presented to the IRB Administrator for documentation of all our CP members who were present and received the training. The focus of the training day was on the ethical conduct of research and the partnership between LLU and our CP organization.

Training Evaluation

To evaluate the effectiveness of the community HS training, LLU presenters used a scoring rubric checklist to assess the community partners' knowledge of the ethical research concepts after the training; this was done via role playing of various "real world" scenarios the data collectors might encounter, such as explaining confidentiality, obtaining informed consent, etc., rather than through more traditional pre- and post-training tests. The community members appreciated the role playing technique as both a way to test their understanding of the concepts and to prepare them for their interactions in the community. All the participating CP members passed the evaluation and received human subjects' research certification from LLU.

After the training, the community partners were each asked by the IRB training presenters if the HS training helped prepare them for data collection in the field; their comments are included below:

If the HS training helped prepare them for data collection in the field:

"Yes, it helped me understand how important personal information is and to deal with confidential data." Hispanic Female

"I liked the training program…I learned about doing research the right way and how we are going to go out and collect the data." Hispanic Male

"I'm not as afraid about going out into the field and working on this research project after having the training." Hispanic Female

If the role playing of the real-world scenarios helped them to understand and apply the ethical principles of research:

"Yes, it helped us understand if we really learned the topic." Hispanic Female

"Yes, because it teaches us how to deal with a situation when needed." Hispanic Female

"Using role playing I learned more about what I'm to do in the field and how to help people be part of our study." Hispanic Female

General comments about the training:

"I really enjoyed the training. You did a great job making it fun and we learned a lot." Hispanic Female

"The role playing was the best part of the training." Hispanic Female

Post-Training Debriefing and Recommendations

After the HS training a post-training debriefing was convened between the LLU researchers, the community partner and the IRB Administrator to discuss the overall results and how we could improve on future trainings with CPs in general. One aspect of the training that was helpful was the role playing by our CP members of situations specific to the research study. Instead of written pre- and post testing, training knowledge was assessed throughout the several interactive role plays, questions and topical discussion, demonstrating that everyone who would be certified had an opportunity to present their acquired expertise. Not only did the scenario role playing re-emphasize the ethical principles for human subjects research, but it also helped to emphasize the study protocol and objectives. Evaluation through role playing, not only allowed evaluation of the community member's knowledge of the HS material presented, but also strengthened the relationship between our CP and LLU team

members as we were encouraged to actively engage with one another. Also helpful was having multiple question and answer sessions throughout the presentation to evaluate the understanding of the information presented.

Over the entire HS training process, from development through post implementation we learned a number of important lessons. One of the major lessons learned was that all partners (IRB, LLU and CP) were vitally important to the success of an effective HS training program. Notably the IRB staff had been previously exposed to the principles of CBPR and had an active working knowledge about how community- based studies call for differing IRB approaches. Thus our IRB Administrator played a key role in facilitating ethics expectations and did so with a more complete understanding of the community needs. Another lesson learned from the training process is that the HS training materials and trainers should be culturally relevant and designed to meet community members' various educational levels. Originally the collaboration consisted of the CP partners translating the standard HS training written materials, and the IRB Administrator conducting the training at the CP's site. However, after discussion, it became apparent that it would be better to train Spanish speaking members from our research team and our CP, who would then together train the remaining CP members that will be taking part in the research project. Each HS training should be adapted to fit the needs of the specific CP and the community they serve. What works well for one CP may need to be altered to work with a different partner.

Another major lesson we learned is that university's IRB training program could adopt the resulting community-orientated HS training for university researchers working with a CP. The general availability of this model for HS training could assist other researchers on how to interact when collaborating with community partners, to promote an additional ethics layer of protection and university expectations and assure the respectful and ethical engagement with the community. An "IRB Tool Kit" is in the process of being developed and will contain a specialized IRB application for community-based research, appropriate consent templates, models for community-relevant HS training, specific ethical guidance for such research, such as suggestions from community partners on community entry and study conduct. In addition plans are underway to create a contact list of researchers willing to share their community-based research and training experiences. Other LLU researchers working on CBPR projects have since contacted our IRB Administrator to find out more information on providing community-orientated HS trainings. With our permission and encouragement, the IRB Administrator has passed along our contact information for the purpose of allowing other researchers across LLU campus to learn more about our experiences working with CBPR and to share information on providing community friendly HS trainings.

We recommend working from the beginning with one's community partner in developing the HS training material and once the training has been completed obtain feedback from them on what worked well and what to improve. Obtaining feedback will facilitate making improvements for future trainings, such as the annual re-certification and for future trainings for new or replacement staff. In addition, continuing to improve and discuss shared experiences from each other's perspective promotes the value of partnerships which is central to CBPR and strengthens the relationship with the CP.

For future collaborations between universities and local CPs it may be helpful from even the initial meetings to encourage each entity to describe their specific strengths and what they uniquely bring to enhance the quality of the research study. Continual re-emphasis on these highlighted qualities throughout all the trainings with appreciation for each organization's specific strengths helps to develop and promote respect between the two partners.

Conclusion

As CBPR expands and researchers engage more actively with the community, universities need to be prepared to provide community friendly ethical training for human subjects research which will further support CBPR partnerships. While local community partners frequently serve as the bridge to the hard-to-reach communities, universities need to be prepared to create the bridge to meet the needs of the CP. University personnel should have an awareness of potential internal barriers for collaboration with external community organizations. Strategies to overcome these obstacles are crucial in developing successful partnerships to engage underserved communities. Training programs and research studies that identify, integrate, and promotes the core human subjects principles themselves from the very beginning, will create a strong foundation for true partnership which is an essential component for increasing community trust and participation in any research study.

Table 1. Key Barriers and Solutions for Implementation of Human Subjects Training for a Community-based Organization

Need: To use local promotores to more effectively engage local, mostly ethnic minority, low income communities in research. This was a challenge since it was necessary for every data collector to be trained and certified in human subjects' protection principles, yet the existing training was designed for academicians and research. ***Barrier – Language & Culture:*** Many of our community partner (CP) members are primarily Spanish speaking, many with low levels of education. In general, they felt more comfortable speaking in Spanish. Due to the language and cultural barriers, simply translating the training materials or even using the available Spanish training materials would not address needs in this situation.
***Solution*:** The Loma Linda University (LLU) Research Protection Program, which provides administrative support to the Institutional Review Board (IRB), helped bilingual LLU researchers and CP staff to design and conduct a culturally responsive community training utilizing adult learning principles. The selected LLU team members shared similar cultural backgrounds with community trainees and understood the challenges of implementing IRB requirements in a community setting.
Barrier -- Conventional web-based human subjects training: The human subjects training curriculum is designed for scientific researchers, not the general public. and is not community friendly. The basic IRB web-based training and exam can take even experienced researchers several hours to complete. Although the National Institutes of Health (NIH) provides a Spanish language version for human subjects' ethical training, it is simply a translation of the English training and was not designed for the lay community. For community members who are unfamiliar with research terminology, the web-based version would be too challenging and may prevent some community partners from passing the exam and taking part in data collection. . Using the web-based training also assumes that the CP will have access to and an understanding of computers as well as the Internet, which is often not the case.

Solution: Together, the IRB Administrator, LLU researchers, and CP personnel developed an on-site training program that met the university standards, which did not rely on the use of computers or existing training materials.
Barrier – LLU, which is leading the research effort, is located a distance away from the community partners, few community partners had reliable transportation, and parking at the university was a challenge.
Solution: The community-developed HS training was provided at the CP's site, which is near to the targeted community. Holding the training at their site helped put trainees at ease and made for a more relaxing environment.
Overall barriers were overcome through team work between researchers, community partners and the IRB Administrator. All worked closely together in planning, developing and implementing a community friendly, skills promoting, fun and engaging tailored human subjects training for the community members, focusing on their specific needs and requirements.

Table 2. Comparison of the IRB HS Power Point Presentation with the Community Presentation

Content Area	Description of the Content Area Information	Number of Slides included in the Content Area for the IRB Presentation (31 slides total)	Number of Slides included in the Content Area for the Community Presentation (35 slides total)
Institutional Review Board	Defining what is an Institutional Review Board (IRB).	2	0
Defining Research	Comparison of research with the practice of medicine.	3	0
CBO Background, Mission and CBPR	Describing the mission and the purpose of this particular CBO.	0	5
Training Goals	Outline of the goals to achieve through the HS training session.	0	1
CBO and Research Studies	Description of CBPR and the research projects this CBO is currently partnering with LLU on.	0	3
Human Subjects	Defining human subjects.	1	1

History	Description of previous events in history that has helped identify the need for protection of human subjects: Nazi Medical Experiments, Tuskegee Syphilis Study…etc.	5	2
Belmont Report	Detailed description of the Belmont Report.	1	0
Ethical Principles of Research	Fundamental ethical principles that guide conduct of human research including: *Respect *Beneficence *Justice.	6	7
Informed Consent	The process of conducting informed consent (oral, passive, active).	2	12
Role Playing Scenarios	Invitations to participate in role playing of various "real world" scenarios.	0	2
Types of IRB Review	Types of institutional IRB review: Exempt, Expedited and Full Board.	5	0
IRB Approval Process	Communications with the IRB. Process of obtaining approval. Tips for success in navigating the IRB process, including the LLU research affairs website. Reporting of incidents.	5	0
Conclusion and Summary	Summary of the main points of the presentation, conclusion and questions from the audience.	1	2

Figure 1. Human Subjects Training

Training Day
Agenda

March 24th
11:30 AM – 1:30 PM

11:30 - 12:00	Serve Lunch	
12:00 – 12:30	Welcome **/** Introductions • Ice Breaker	(Community Partner (CP)) (Loma Linda University (LLU))
12:30 - 12:45	Community Based Participatory Research • Objectives for the day • Partnership	(CP)
12:45 - 1:30	Loma Linda University Studies • Emergency Preparedness • Railyard	(LLU)
1:30 - 2:30	Principles of Research • Respect • Beneficence • Justice	(CP)
2:30 - 3:00	Group Activity: Applying the Principles of Research • Role Play in Pairs – 10 mins • Role Play Demonstration w/feedback – 20 mins	(LLU)
3:00 - 3:30	Informed Consent • It's a process • Important Elements	(CP)
3:30 - 3:45	Group Activity: Applying the Principles of Research • Role Play in Pairs – 10 mins • Role Play Demonstration w/feedback – 20 mins	(LLU)
3:45 - 4:00	Summary, Final Questions and Closing • Next Steps	(CP/LLU)

3.2 Community Perceptions

In addition to the process of developing and refining our quantitative surveys, we also collected qualitative information, in the form of key informant interviews (KIs) and focus groups (FGs), to help us to understand the challenges faced by community members living near the SBR. During our discussions with community members, it was apparent that while community members expressed concern for poor air quality, for them other, more urgent issues took priority -- jobs, neighborhood violence, and access to healthcare, to name a few. They saw railyard as both an asset and a barrier to their ability to live a better life. Participants felt that the railyard has a positive reputation and is highly valued for the jobs and economic growth it provides. However, it was also perceived as a major contributor to the already poor air quality and considered a major source of noise pollution. Several participants believe that living so close to the railyard has caused ailments in family, friends, and neighbors, as well as themselves. None of the community members participating in our study wanted the railyard to close or relocate, but many expressed a strong desire for the railyard to "step up," be a good neighbor, and make reasonable changes to help protect the surrounding community from the noise and air pollution it generates. Attendees reported feeling that the railyard does not listen to the suggestions from residents about ways to reduce the impact their facility has on the surrounding community (i.e. alternate routes; relocating the entry gate to reduce idling truck emissions and traffic burdens; using more updated, less polluting equipment). Some participants feel that they have sacrificed for the benefit of the railyard and are concerned about the health impact of life near such a busy railyard, especially for their children.

The findings from the focus groups have been included in a manuscript which has been accepted for publication in the *Journal of Environmental Health* (see below). In addition to conducting the focus groups and key informant interviews for insights into the opinions and experiences of community residents, we also included questions to the quantitative household survey to assess community needs. Residents were asked, "Is there anything that you would like to see improved within your community?", and the responses coded for recurrent themes and organized into categories. Results from the survey analysis indicated that in addition to concern for the air quality, residents living closest to the railyard had other competing interests (these findings were presented at the Annual American Public Health meeting in Boston, 2013).

While air quality and health were seen as important, people closest to the SBR expressed even stronger concerns about more immediate and tangible issues: lack of police, security, street lighting and repair; and trees and greenery. Overall, the findings from the focus groups, when combined with suggestions from community assessment surveys, indicate the community's desire for strategies to mitigate their exposure to

diesel emissions, reduce the possibility of adverse health effects, and for ongoing research to confirm our findings, assess air and noise pollution as well as additional health endpoints (i.e. cognitive function, obesity).

EXPERIENCES OF A RAILYARD COMMUNITY: LIFE IS HARD

Authors

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Residential Perspective of Life Near a Railyard: A Qualitative Study Exploring the Perspective of People Living Near a Major Railyard in San Bernardino, California.

Acknowledgement

This research was funded by the South Coast Air Quality Management District (SCAQMD)/BP West Coast Products Oversight Committee, LLC grant # 659005 and also supported by NIH # 1P20MD006988.

Accepted for Publication

The Journal of Environmental Health

ABSTRACT

Background: Community groups and local air pollution control agencies have identified the San Bernardino Railyard (SBR) as a significant public health and environmental justice issue. In response, we conducted a comprehensive study with community members living in close proximity to the railyard. The purpose of this paper is to share the community's perceptions about the railyard and ideas on sustainable change.

Methods: A qualitative study was conducted with emerging themes from key informant interviews (N=12) and focus group discussions (N=5; 53 community members). Interviews were audio recorded and transcribed; analyses were conducted using inductive methods of coding and theming.

Results: Four themes emerged: "health as unattainable value," "air quality challenges," "railyard pros and cons," and "violence and unemployment ripple effect." Community participants expressed concern for poor air quality, but other challenges took priority.

Conclusions: Our findings suggest that future mitigation work to reduce air pollution exposure should not only focus on reducing risk from air pollution but address significant co-occurring community challenges. Local institutions, businesses, medical centers, public health departments and universities should work collaboratively to promote critically needed sustainable change. A comprehensive collaborative approach that puts health on the agenda is warranted in addressing impacted communities in close proximity to the goods movement industry.

BACKGROUND

The transportation of goods can both promote and adversely impact health. Goods movement activities can promote health by, for example, enabling access to employment and better services. However, transportation of goods can also degrade quality of life and damage health due to various environmental and societal impacts such as air pollution; climate change; injuries; noise; landscape disruption; diminished sense of community; stress; and anxiety [93]. Environmental health scientists are beginning to elucidate the linkages between the air pollution from international trade and goods movement and health [6, 7].

Mounting research indicates that persons living near transportation hubs and corridors are exposed to higher levels of airborne pollutants, including diesel exhaust and other emissions; the EPA has determined that diesel exhaust is “likely to be carcinogenic to humans by inhalation” [94]. Health impacts from the air pollution associated with goods movement include respiratory illnesses; increased premature death; risk of heart disease; elevated cancer risk; adverse birth outcomes; effects on the immune system; multiple respiratory effects; and neurotoxicity [95-98]; [24, 29, 99-102]. Furthermore, the strengths of associations described for traffic-related exposures are directly related to the proximity to major roadways [103, 104]. Children are especially vulnerable, and those living near freeways have been shown to have substantial deficits in lung function and development as well as exacerbation of asthma symptoms [26, 105-108]; others have linked traffic exposure to increased risk of low birth weight and premature birth [27].

Growing emissions from trucks and trains in regions with major segments of the goods movement network can add to existing air quality problems and impact specific local communities. In the City of San Bernardino, there is one such community located in close proximity to a major freight rail yard, we have identified as the San Bernardino Railyard (SBR). The SBR is one of the busiest facilities of its kind in California and a major inland hub for goods shipped from the ports of Los Angeles (figure 1). The City of San Bernardino and the railroads have been interlinked throughout the nearly 200-year history of the City, with railroad operations changing to predominately freight based operations since the 1990s. With operations running 24/7, the SBR is a crucial hub for freight and shipping for the whole country. Given the nature and intensity of the work performed at the SBR, it is not unrealistic to think air pollution levels in the immediately surrounding areas would be higher relative to other locations within the city. The potential health impacts could also be significant since the facility is close to residential neighborhoods, day care facilities, and an elementary school located within 500 yards of the railyard.

Based on the risk assessments conducted by the California Air Resources Board (CARB), the SBR facility ranks among the top 5 most polluting rail yards in California and first in terms of community health risk due to the large population living in the immediate vicinity [13]. Table 1 summarizes the key socio-demographic indicators of the community members residing within one half mile of the surrounding railyard, obtained through Census 2010 data and modeled with geographic information system (GIS) software. The population immediately around the SBR is defined primarily by young

(including a large proportion of children), low income, and largely Latino members. Available health outcomes data suggest tremendous health disparities between the region's African Americans and Latinos and the Caucasian population. While the overall county's poverty rate is 15.8%, the rate for Latinos stands at 34.9%, which far exceeds the overall poverty rate for the state (14.2%), the nation (12.4%) and even California's Latino poverty rate of 28% (U.S. Census Bureau, 2005). Further limiting available support for community members was the 2012 bankruptcy of the city of San Bernardino, making this one of the area's poorest municipalities, with a disproportionate number of neighborhoods facing a host of economic, educational, health, and environmental challenges.

Fueled by the CARB report on the potential health effects for residents, some community members have voiced an urgent call to action to the City's Mayor, politicians, and local researchers to address these environmental justice issues. In response, researchers, in collaboration with residents and a local community-based organization, formed the Environmental Railyard Research Impacting Community Health (ENRRICH) Project. Using a community-based-participatory-research (CBPR) approach, ENRRICH aimed to explore the health risks of residents living in close proximity to the railyard and to support the development of a community response plan. While the overall study goals involve quantitative community and child assessments, the initial research phase used qualitative methods to better understand the context of risk experienced by the residents. As a CBPR study, ENRRICH emphasizes the significant role of community input, ownership, and concerted efforts in risk reduction to produce appropriate, innovative and practical solutions which are cost-effective and sustainable [109]. Therefore, we conducted a qualitative study to gain community members' perspectives about life near the railyard.

METHODS

We conducted this qualitative inquiry using inductive Grounded Theory (GT) methods that included carefully documented participant and site observations.. A GT approach was selected because this method gives participants a "voice" allowing them to share their reality; in fact, creating a 'theory of their lives," grounded in their self-described reality. Rather than acting on our own "expert" opinions, this approach enabled discovery of the participants' main concerns and how they try to solve the challenges, without any prior preconceived hypothesis influencing the results. We collected resident feedback about their perceptions on life near the railyard through the conduct of semi-structured key informant interviews (N=12) which were coded and themed and the results used to design the validation focus groups (N=5 with 8-13 participants each). The focus groups were conducted by trained bi-lingual facilitators and lasted 60-90 minutes. Participants were selected using theoretical sampling to assure triangulation in order to draw a broad variety of perspectives (politicians, community organizers, business owners, residents who represented the local community make-up and cultural identity). More specifically, we asked residents about their lives, exploring their perceived quality of life, health challenges, including their perceptions of the potential effects of air pollution on themselves and their children, and their thoughts on the nearby railyard. Four of the focus groups (two in Spanish with

monolingual Latino residents, one each in English with Latino and African American residents) were conducted at a community center near the SBR, while one (conducted in English) was convened at a nearby homeless shelter. Each participant signed informed consent forms that were approved by the university's Institutional Review Board. All interviews and focus groups were audio taped and transcribed verbatim. Once transcribed, the text was coded for emergent codes and a final codebook was developed. Transcripts were read and coded independently by several research assistants, using the coding in conjunction with a constant comparison method; emergent themes were then determined.

RESULTS

A total of 65 adults participated in the key informant interviews and focus groups. Participants included male and female community members ranging in age from 18-60+. Four major themes emerged and are described below: 1) violence and unemployment ripple effect; 2) air quality challenges; 3) pros and cons of the railyard; and 4) health as an unattainable value. Further analysis of themes led to the integration of all four into one core concept:- *Experiences of the Railyard Community: Life is Hard.* Table 2 includes a sample of quotes from the community members surrounding each of the identified themes.

Violence and unemployment ripple effect

Although we discussed other community issues and challenges in the context of air pollution and concerns regarding the railyard it is noteworthy that the high levels of violence, homelessness, and unemployment experienced by many members in this community emerged as a primary issue. At numerous points during the group discussions, the conversation turned to these topics as they clearly affected almost everyone in the community. Drug use and distribution, gang violence, and robberies were cited as daily occurrences, and the safety of family and friends were top priorities. Associated with the high unemployment and prominent in the conversations were reports of increasing numbers of individuals and entire families that were homeless. Together these reports paint a picture of a struggling community plagued with violence and poverty, conditions which some participants felt would not improve. Indeed, this affected the way many residents felt about their exposure to polluted air: while recognizing it as negative they clearly placed it further down their list of priorities compared to daily survival.

Adding to concerns about these pressing community problems was the fear that their children would become just another violence statistic. Participants reported that increasingly families are headed by a single parent who must provide for the entire family and as a result the children and youth often do not have the necessary supervision. Many saw this as a contributing factor to an increase in youth related crime and gang violence. Interviewees expressed a concern about the lack of alternatives and programs for young people in the community. The local community center was identified as the sole remaining safe and fun place to take their kids; a lone

asset. Overall, safety for themselves and their families was a top priority for participants, with many expressing desperation and a general lack of control over decreasing the level of community violence.

Community infrastructure was cited as a contributing factor in violence. Since the economic downturn, the few remaining community businesses in the area include liquor and convenience stores, auto shops, bail bondsmen, payday loan stores, and nightclubs, most of which are not viewed as supportive of a healthy lifestyle or environment by the community members. Participants also reported serious problems in the city's infrastructure, such as the lack of sidewalks, faulty or non-existent street lights, increasing numbers of abandoned houses, empty lots with over grown weeds, poorly maintained parks and community centers, and businesses increasingly relocating out of the city, all of which negatively impacts their already struggling community.

As mentioned above, we conducted ethnographies and observed community life as part of our qualitative inquiry. When comparing the neighborhoods surrounding the railyard with other nearby communities, there was a tangible difference in the environment. The area is eerily grey and dusty, and feels abandoned despite its high population density. This in combination with the ever present clanging noises of the railyard creates a feeling of an industrial desert in which residents are somewhat hidden, quickly entering and exiting the homes that provide them some respite from the dust, heat, and noise. Many community members considered moving away from the area, but the low cost of living compared to surrounding communities keeps them here. Residents feel torn between keeping their families in an area where than afford to live but that exposes them to many health and safety hazards *versus* moving to a healthier but more costly area beyond their financial means.

Air Quality Challenges

A second emergent theme, air quality, was woven into the experiences of people living in the Inland Empire area, which is already known for its poor air quality. The majority of participants reported that their adult families or friends often experience poor health and disease, but few saw a link between the air pollution and poor health. For children, respiratory illnesses such as asthma, allergies, and chronic cough were reported as common, ongoing health problems, with many acknowledging that the surrounding environment likely affects their child's condition. Some community participants pointed out children's particular vulnerability, voicing concerns that poor air quality may be affecting their children's health. Even so, during the discussion about air quality, the conversation often returned to the more urgent issue of violence and safety. Many interviewees acknowledged the air quality was not the best, but felt that poor air quality was the least of their worries. They seemed resigned to their lack of control on the air quality issue, and that they are simply trying to "get by" and coexist with the problem.

Railyard Pros and Cons

A third emergent theme, Railyard Pros and Cons, was centered on interviewees' shared perceptions about life near a major railyard. For them, the railyard was seen as

both an asset and a barrier to their ability to live a better life. Participants felt that the railyard has a positive reputation and is highly valued for the jobs and economic growth it provides. However, it was also perceived as a major contributor to both the surrounding poor air quality as well as the noise pollution. Several participants believe that living so close to the railyard has caused ailments in family, friends, and neighbors, as well as themselves. However, despite the fact that none of our respondents reported ever having worked or having a relative or a friend who worked for the railyard, none of the community members participating in our study wanted the railyard to close or relocate. Their own experience with unemployment makes them value the potential for jobs for others even if they themselves can't benefit. However, many expressed a strong desire for the railyard to "step up," be a good neighbor, and make reasonable changes to help protect the surrounding community from the noise and air pollution it generates. Attendees felt that the railyard does not listen to suggestions from residents (i.e. alternate routes, more updated equipment) about ways to reduce the impact their facility has on the surrounding community. Some participants feel that they have sacrificed for the benefit of the railyard and are concerned about the health impact of life near such a busy railyard, especially for their children.

More noted than air-pollution, a recurring comment from community members was the unrelenting noise emanating from the railyard, where operations are conducted "24/7." Community members expressed annoyance with the noise, specifically citing the noise of trains and semi-trucks, whistles sounding in the night, and boxcars crashing up against one another. Community members reported that the noise affected their sleep, causing side effects such as tiredness and lack of concentration at school for the kids and on the job for themselves. Many also noted that in addition to the noise the physical "rattling and shaking" has affected them as well as their homes.

In addition, the semi-trucks driving in and out of the railyard to load and unload freight were seen as major contributors to the railyard pollution. Residents noted that despite posted signs prohibiting parking and idling in residential areas, trucks continue to do so near homes and the community park. Residents report that there is little to no enforcement of these posted rules, which was validated during our ethnographies.

Health as an Unattainable Value

Our final theme centered on the idea that our participants feel that, as adults, achieving optimal personal health and gaining access to health care are, for the most part out of their reach – "unattainable"-- and is more than they can realistically expect for themselves. However, they have not yet given up hope that their children will live a better and healthier life, which includes access to routine medical services. That said, the reality for our participants is that few have health insurance or the financial resources to take their child to the physician for regular exams or even when they are sick. Many parents interviewed reported that they saw their children and a large proportion of the children in the community as chronically ill, especially with respiratory illnesses, and that they see it as inevitable that more and more will develop chronic respiratory illnesses.

Interrelationships Among the Themes

Our four emergent themes, while separate, are also clearly interwoven into a single core concept: *Experiences of the Railyard Community: Life is Hard*. The "Life is Hard" theme sums up the experiences of the residents who live adjacent to the railyard. While no one raised the issue of fairness, the residents seem somewhat resigned to their situation, especially for themselves as adults; the only resistance to the status quo came when discussing their children's health. The theme of violence and unemployment is directly linked with health as an unattainable value, since many community participants reported that lack of jobs translates into a lack of health care access for themselves and their families. Adding to the challenge of lacking access to health care is the fact that living in close proximity to the railyard negatively impacts the respiratory health of children, exacerbating problems and further increasing the need for health care services, clearly a less than ideal situation for raising a healthy family.

DISCUSSION

Our findings indicate that members residing near the railyard live in a community with multiple, significant barriers to their quality of life, with many factors interrelated and stemming from the economic downturn. The major concerns voiced by our participants centered on the high level of community violence, serious economic problems, homelessness, railyard-related noise exposure, and lack of access to healthcare, especially for their children, many of whom suffer from poor respiratory health. Public health scientists are beginning to point to the linkages between how goods and services are accessed and distributed across the nation and various environmental and societal impacts such as air pollution, noise, stress and anxiety, loss of land, and blight that can burden local communities [93]. Increasing evidence reported by the Governor's Environmental Action Plan, that communities near goods movement ports are subsidizing the movement of goods with their own health, highlights the need for continued intervention and policy advancement aimed at reducing exposure to diesel emissions to protect the health of the public [7].

The health of this community, particularly the more vulnerable subpopulations (i.e. children, elderly), is of great concern given the environment in which they live, their lack of access to health care, and stresses related to violence. It has well been documented that neighborhood-level conditions have a strong impact on individual health status, including morbidity and mortality [110-112]. Additionally, research suggests that disadvantaged populations who suffer from chronic stressors experience even greater susceptibility to environmental hazards [77]. In our target community, 27.6 % of residents live below the poverty line and FBI crime statistics report a per capita violent crime rate nearly 2.5 times the national average. This "double jeopardy" of life-stress and pollution related stressors points to an even greater potential vulnerability for this underserved and overlooked community.

Researchers have identified a strong association between ambient air pollution and other socio-demographically related stressors and adverse health outcomes.

Clougherty et al. (2007) have reported the synergistic effect of traffic-related air pollution and exposure to violence on urban asthma etiology. Chen et al. (2008) have reported that chronic traffic-related air pollution and stress interact to predict biologic and clinical outcomes in asthma that are stronger than either factor alone. Research conducted in southern California indicates that children from stressful households are more susceptible to the negative effects of traffic-related air pollution on respiratory health [11, 12]. Clearly, living in an area in which the adverse health effects associated with air pollution are magnified in the presence of other non-pollution related stressors highlights a critical need for routine medical services and additional support for positive community change.

In our inquiry, it became clear that many community members felt overwhelmed with the day-to-day challenge of simply surviving and providing for their families; these challenges often outweighed their concern for poor air quality, even as they acknowledged its existence. Indeed, during the focus groups some members became irritated with the discussion of air quality and suggested focusing on more pressing issues. Only a small number of participants were vocal about the health effects associated with air pollution, while most had resigned themselves to coexisting with the poor air quality. The internal pressures of day to day living can greatly influence a person's perception of the surrounding community environment and their subsequent behavior, especially given the daily burden of survival [113]. In light of the challenges faced by residents, it is not difficult to understand why air quality might rank lower on their list of priorities.

One notable exception is parents' deep concern for the health of their children. There was awareness that the numbers children diagnosed with asthma is increasing and many believed that most children in the area either already have asthma or will develop it in the future. However, only a few parents connected increased asthma incidence with exposure to pollution from the nearby railyard. As this line of discussion continued, it became apparent that some parents were angry that air pollution from the railyard may be jeopardizing their children's health or the health of children in their community. They found it deeply upsetting that railyard-related air pollution may not only increase their child's risk of developing asthma, but may exacerbate the asthma symptoms of children already diagnosed with the condition, in essence increasing the need for medical services which many families already find difficult or impossible to access. During the discussions it became evident that their children's health was a unifying issue for the community and potential mobilization point.

Implications for Change

In addition to participant feedback about their experiences, we were also able to identify suggestions for things that could be done by the railyard and by other local agencies, businesses, institutions, and medical centers to reduce pollution and their exposure to it. The suggestions focused on improvements which included increased access to medical services and routine health screenings, development of a more extensive vegetation barrier and community wide tree planting campaign, relocation of the entry gate to the railyard to remove truck traffic and related idling from the adjacent neighborhood, and

provision of safe and pollution-"freer" places for their children to play. Other ideas discussed included bringing upgraded air filters to local schools and implementing community noise and pollution reduction programs. Table 3 describes the suggested changes for the area in promoting a healthier community. A report by the National Environmental Justice Advisory (NEJA) council to the EPA titled "Reducing Air Emissions Associated With Goods Movement: Working Towards Environmental Justice," contains advice and recommendations about how the EPA can most effectively promote strategies, in partnership with federal, state, tribal, and local government agencies and other stakeholders, to identify, mitigate, and/or prevent the disproportionate burden of air pollution resulting from goods movement on communities [94]. The NEJA report encourages a sense of urgency in developing strategies and taking action, and advocates for additional research with strong community involvement and capacity building. For this underserved community there is an immediate and great need for sustainable community improvements that address air quality issues, but also consideration for the other pressing needs identified by community participants [114].

The health and environmental challenges faced by this community are likely a common phenomenon faced by communities in close proximity to major goods movement facilities across the nation. Given the gravity of the situation and their challenges, the needs of this community and similar communities should be addressed by policy leaders and advocates by taking a Health in all Policies Approach (HiAP). According to the National Association of County and City Health Officials (NACCHO) HiAP is an innovative and strategic approach through which policies are created and implemented, emphasizing the need for input and collaboration across industry and sectors to ultimately achieve common health goals [115]. The enormity and complexity of the conditions faced by community residents call for the use of a HiAP approach in addressing their health and environmental challenges. Only through a coordinated effort from surrounding key government, business, and institutional agencies will positive improvements be implemented and sustained. Linking community planning to the goals of increasing population health and decreasing exposure to harmful risk factors can be successfully implemented and sustained [116, 117]. A combined approach focusing on the goods movement communities and prevention, which addresses the variety of factors which determine health could address a problem that is drastically and negatively influencing the health trajectory of the community [114].

Limitations

Given the qualitative nature of our study, there are some noteworthy limitations. The information we gained is the opinion of a sample of our target community and may not represent the views of all community members. However, we conducted systematic theoretical sampling to recruit participants from each community stratum to accurately represent community demographics. As a result, we managed to recruit an ethnically diverse group of community participants from varying educational backgrounds and work profiles, including the unemployed and homeless.

CONCLUSION

Our inquiry was successful in providing important insights into the life of community members who live adjacent to a railyard that has been identified as a major source of pollution. Our findings suggest that future efforts to reduce exposure to air pollution must take into consideration other major community challenges, including increased access to health care and a reduction in community violence. Most importantly, there is a need for a coordinated effort of governmental and private entities to strategically address these challenges and provide support for this truly underserved and isolated community. A systematic approach should be taken by policy leaders and advocates with policy development grounded in HiAP addressing communities across the nation that are impacted by the goods movement industry. As we all are the beneficiary of inexpensive goods shipped through this and other container-yards, we have an ethical obligation to support positive community improvements for those who carry an undue health burden as a side-effect of our access to inexpensive goods.

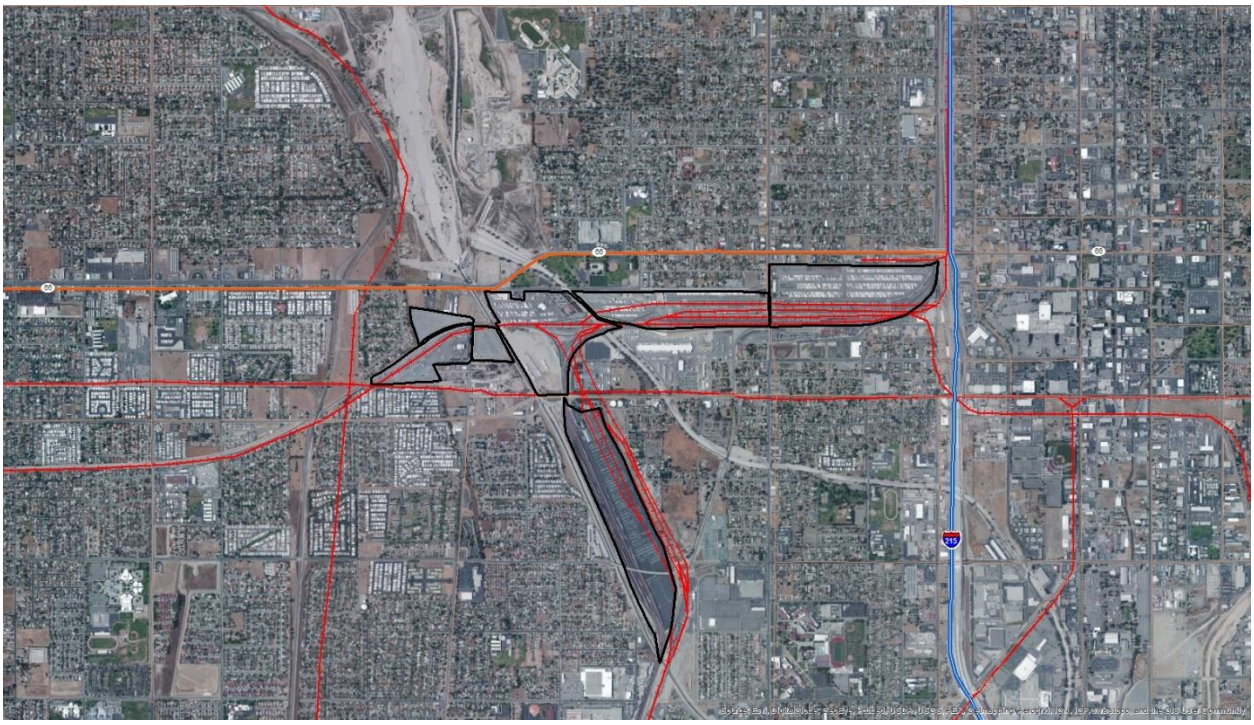

Figure 1. Aerial map of the San Bernardino Railyard and Surrounding Community

Table 1. Socio-demographic Characteristics of the Community Residing Within One-Half Mile of the San Bernardino Railyard

Socio-demographic Variables	
Total Population	7,172
Households	1,895
% African Americans	9.0
% Hispanics	82.3
% Children < 5 years of age	11.7
% Children 5 – 17 years of age	27.5
Median age (yrs.)	25.2
Average household size (persons)	3.9
Median household income	$28,214

Table 2. Community Participant Responses on the Thematic Topics Regarding Life Near A Major Railyard

VIOLENCE AND EMPLOYMENT CHALLENGES
Community violence and unemployment rates affected residents' feelings about their exposure to polluted air, ranking it lower than other, more immediate priorities related to day-to-day survival. 1) *"Oh. There's a little bit of everything… People trying to rob you… You just can find yourself in the wrong place, who knows…you might come up on a nice pair of shoes and this dude comes along with a gun and they will be his." – Male* 2) *"…. there's more to worry about than the actual air." – Male* 3) *"We were at the park…next thing you know, my girls are seeing a stabbing and they, they don't need to see that..." – Female* 4) *"….Trust me, I want good health, I want good air, I want the city to be awesome by the time my great-grandkids live here, you know what I mean? But by the same token, I think other things need to be fixed beside that." – Male* 5) *"…if you're in San Bernardino and you're in the slum ain't nothing gonna change". – Male* Participants reported feeling powerless to reduce the level of violence in their area, and high levels of concern for their children's safety. 6) *"I'm worried about the safety of my children…you can't just have them outside..." – Female* 7) *"I think for the youths, they don't have nothing to do…. there's a lot of youngsters from all different areas that hang out right there...these*

kids need something to do with their lives." – Female

Empty lots with over grown weeds and businesses that have relocated out of the city: these are some of the factors negatively impacting the health and vitality of their community.

8) *"…There is just too many abandoned buildings…"– Female*
9) *"I've seen this community go from a family neighborhood to run-down or abandoned houses, empty lots and growing weeds." – Male*
10) *"Most of the businesses are leaving San Bernardino for other cities in the area. We used to have a mall down the street, it's all gone now." – Male*

Community members said they would like to move out of the area, but couldn't afford to.

11) *"I do not like this place, but we chose it because it was the place we could afford. I have lived here for 7 years and the city is cheap, we are here because we don't have more resources to be in another area" – Caucasian Female*
12) *"Unfortunately, this is one of the most economical places to live, but the consequences for living here is too great, not for what you pay financially, but that your health is seriously affected" – Hispanicfemale*

AIR QUALITY CHALLENGES

Participants pointed out that children are most vulnerable and voiced a growing concern that poor air quality may be affecting their children's health.

13) *"I have a nephew and he has allergies awfully bad and it's like blowing his nose and stuff 24 hours a day….. every time I see him he blowing his nose and it seems like the air is more toxic and makes it worse." – Hispanic Female*

14) *"…the people more affected are the kids because they go to school and are breathing contaminated air inside and outside the classroom…here we have one school, less than half a mile from the railyard and the number of asthma cases is increasing." – Hispanic Female*

Some community participants noted the difference in air quality at different times of the day and seasons.

15) *"I'll wake up in the mornings, like, I can't breathe." – Hispanic Female*

16) *"When the weather is the hottest, that is when we have the most kids that are sick, with little kids getting sick with a horrendous cough, like a smoker's cough." – Female*

RAILYARD CHALLENGES

Members understand that semi-truck movement around the railyard is necessary but are frustrated by spotty enforcement of truck idling laws.

17) *"… they're idling in their trucks and there are signs out there saying "do not park your vehicles there". – African American Female*

18) *"They'll park their trucks wherever they wanna park it, and there is nothing to be said about it. You got to go to the right places and get to the right people to respond, because if you don't, they ain't gonna do nothing about it" – African American Male*

Noise pollution causes sleep disturbances and other stressors, including physical "rattling and shaking" of nearby homes caused by railyard activities.

19) *"I guess it was naïve of me to think that when the traffic dies down so will the noise, but there is still a lot of noise happening within the night. I know that it's affecting me and it's also affecting others in the community because they report hearing this especially when they are sleeping." – Hispanic Female*

20) *"Yeah it's pretty loud. You hear it in the middle of the night, BOOM it wakes you up. I live about 2 blocks away and you can still hear it real loud." – African American Female*

21) *"The noise bothers me too much. I live in a mobile home and when the train passes by my house, the whole house shakes. That's where I live and it's a house that I am paying for and that is the sacrifice we are all doing." – Hispanic Female*

Participants felt that they have sacrificed overall quality of life for the benefit of the railyard, and are concerned about health impacts on their families, especially their children.

22) *"I think we like the package from where we live, what we do not like is that the railway is so close because that affects us. My husband has symptoms of asthma, and then allergies follow. My youngest daughter also gets the flu and bronchitis. We would like for the railyard to be more careful." – Hispanic Female*

23) *"I want to say that the contamination that the train brings and the type of fuel that it uses is reflected in the kids' health, for me it is obvious that they go hand in hand." – Hispanic Female*

24) *" …because they continue to use dirty equipment, then that pollutes the air which harms the neighbors. So all we want is really for them to be good neighbors, to be responsible." – Hispanic Female*

25) *"Companies are the masters of the nation and they do not listen to our concerns because for all the calls that have been done to tell them to maintain and update their equipment it appears that we have not done the petition correctly." – Caucasian Female*

HEALTH CARE CHALLENGES

Community participants view health and access to healthcare as an unattainable value for themselves, but haven't given up hope of obtaining it for their children.

26) *"The community worries me, but first I have to worry about my family. Many of us have no health insurance and these diseases, tumors, asthma, having to constantly go to the doctor is expensive, that worries the mom, dad, children, and the whole family." – Hispanic Female*

27) *"I am a grandmother to 6 kids and I don't matter much, but the little ones do." – Hispanic Female*

28) *"The situation with children in this community is very bad. My granddaughter was not sick so often, but since she moved and lives with me she constantly gets sick. " – Hispanic Female*

Table 3. Community Challenges and Suggestions for Positive Change

COMMUNITY CHALLENGE	SUGGESTIONS FOR IMPROVEMENT
NOISE	*Our research team suggests a larger vegetation border surrounding the entire railyard perimeter would help to reduce noise pollution; researchers have found that strategic plant selection has proven effective for noise reduction [118, 119]. The railyard has contributed funding for a vegetation border on a nearby street, but a larger border would be even more beneficial. *Better insulation and thicker windows would reduce noise, especially for those residents living within a few blocks of the railyard. Quiet Solutions, a California based soundproofing manufacturer, has developed a product line that can be applied to existing walls to reduce transmission of sound [120]. Since most noise complaints were associated with close residential proximity to the railyard, one recommendation was that the SBR railyard support and assist nearby residents with the cost of improved insulation and new windows for their homes. *Participants requested that the railyard consider adjusting railyard schedules to decrease overnight traffic, when most residents are sleeping. *Our research team suggested universities and research institutions conduct systematic assessments to monitor noise pollution around the railyard and throughout the community and identify steps to mitigate impact and improve community health and quality of life.
POOR AIR QUALITY	*Currently there is a small vegetation border between the railyard and some homes. To improve air quality and reduce

	noise, a carefully planned, robust vegetation border should be planted to surround the perimeter of the railyard, especially in areas where homes share a retaining wall with the railyard. With strategic planning, urban vegetation has been shown to reduce atmospheric pollutants [121-123]. *Community members suggested moving the entrance of the SBR to a location farther away from homes. Community participants reported that this has been requested many times but has not been implemented. The relocation of the entrance to the SBR should be re-evaluated and a top priority. * Community participants suggested that the railyard take an active role in monitoring and reducing the idling of semi-trucks in residential areas. * Participants requested increased use of less polluting, “clean engines” at the SBR. Though these engines are increasingly used at the SBR, they rotate through all the Company’s facilities nationwide, potentially spending less time at SBR, the railyard most closely located to a densely populated residential area. No official reporting on their use is available. The NEJAC report to the EPA advocates for accelerated introduction of existing, cleaner technologies and systems by providing needed resources using incentives, regulatory actions and technical assistance [94]. *Lastly, the research team recommends an increase in air quality monitoring throughout the residential area near the SBR and additional health research to better understand exposures and to inform strategies for exposure mitigation. The NEJAC report advocates for additional research with strong community involvement to accelerate exposure reduction activities [94]. *Policy development and exposure mitigation strategies are needed for schools and child care facilities currently residing in close proximity to a major goods movement source.
LACK OF HEALTH SERVICES	*Local medical institutions and the county public health department should help provide care, specifically targeting the railyard community. One recommendation is to provide more regular and long-term mobile clinics offering free services, especially for children. Even reduced or sliding scale fees at local clinics may cost more than many families can afford. Of

	note, recent efforts by our collaborative have brought a mobile clinic to the community on a regular basis, and though this is a step in the right direction, it does not fully address the health needs of local residents. Mobile clinics are effective in reaching underserved communities and providing cost-effective preventive health services [124].
VIOLENCE	*Participants have requested the community center offer more programs to provide young people with activities and recreation, reducing the time they spend on the streets. However, with San Bernardino's bankruptcy filing it will take major outside funding to support the infrastructure changes needed (i.e. more community programs, repaired sidewalks, increased lighting…etc.). *Participants suggested increased lighting as a way to reduce crime and make people feel more comfortable in their surroundings. Researchers have identified positive effect in use of lighting to reduce crime [125]. *Participants suggested a tree planting campaign to help encourage people to spend more time outside, making their community aesthetically pleasing and providing much-needed shade. Published studies suggest a potential association between trees in public areas and lower crime rates as well as reduced stress levels [126-128].

3.3 HOUSEHOLD-LEVEL HEALTH SURVEY OF ADULT RESIDENTS

The household-level survey was conducted to achieve two primary goals: (1) to establish baseline information on the burden of disease among adult residents in the communities surrounding the SBR, and (2) to assess the potential association between residential proximity to the SBR and the prevalence of adverse health effects. We present below a description of the methodological framework as well as the results from this sub-study.

3.3.1 Study Design

We used a cross-sectional design to assess the relationship between air pollution levels near the SBR, compared to areas outside the RIZ (see **Figure 1-2**), and adverse health effects among nearby adult residents. We collected interviews at households located at varying distances upwind and downwind across the spatial gradient of diesel PM concentrations in the areas surrounding the SBR (see **Figure 3-1**). Residential proximity to the SBR was used as a proxy of exposure. We compared the prevalence of adverse health effects among "exposed" adults—i.e., from households located near the SBR— to that among residents from the "background" areas further away. To account for the seasonal variation in local air quality we conducted two cross-sectional waves of data collection, one in the summer of 2011 and the second in the winter-spring of 2012. In all, over 1,000 households were surveyed to gather data on the prevalence of respiratory symptoms and conditions as well as two biologic outcomes: peak expiratory flow and airway inflammation.

3.3.2 Sampling Strategy

The household survey data were collected from within three sampling zones, A, B, and C, in the communities surrounding the SBR. The location and spatial configuration of the sampling regions are depicted in **Figure 3-1**. We designed these three regions to model decreasing levels of air pollution exposure, from highest (A) to lowest or background (C), away from the SBR. These sampling zones were defined across the spatial gradient of air pollution and associated health risks as presented in the CARB's HRA report (see **Figure 1-2**). As presented in the HRA Report, the gradient was originally derived through the computer-based air dispersion modeling. Cancer risk was then characterized by combining the cancer potency factor of diesel PM with the model-predicted concentrations over space. The result is the overall RIZ (see Chapter 1), within which there is an elevation in modeled cancer risk above the risk due to background impacts. The 10 isopleth, as shown in **Figure 1-2**, defines the boundary of the RIZ. Our reference region C models background exposure levels and closely follows the boundary of the RIZ. Region B roughly corresponded to the impact area contained within the 50-100 x 10^{-6} cancer risk range (**Figure 1-2**). Based on our discussions with colleagues from UCLA, we decided to modify our household sampling scheme by adding region A in order to include in our sample households in very close proximity to the SBR. We defined region A by delineating a 350-meter buffer around the perimeter of the railyard facility; we then considered for sampling purposes every house within region A. This intensive sampling approach was designed to match the sharp decline

of diesel PM concentrations which was postulated to occur over a short distance from the SBR.

Within sampling regions B and C, we employed a 2-stage cluster sampling methodology to select our target households. Sixty census blocks within each sampling zone were first randomly selected and then a set of five houses within each census block was chosen. To facilitate rigor as well as ease of selection of households, we used digital street and cadastral maps of the target neighborhoods and selected households for interviews using a GIS-based random number generator tool.

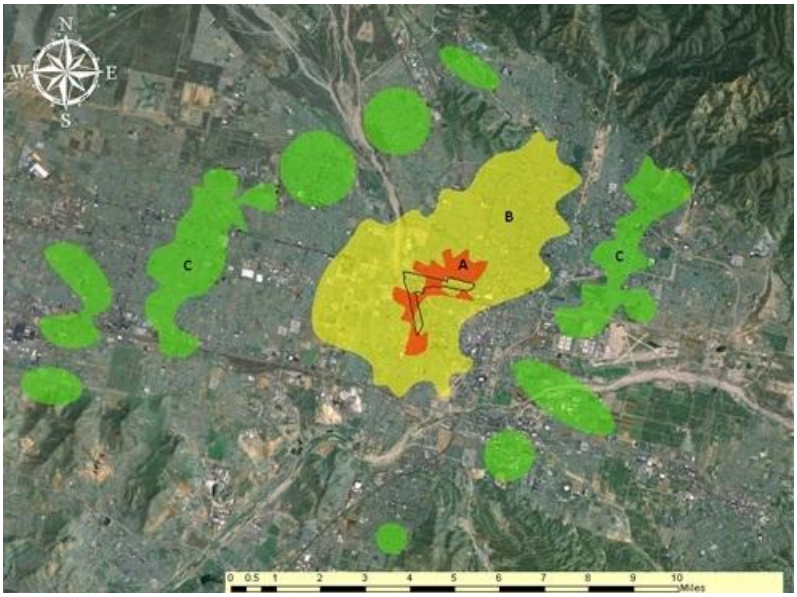

FIGURE 3-1. MAP OF STUDY AREA WITH THE RAILYARD SILHOUETTED IN THE CENTER AND THE SURROUNDING SAMPLING AREAS FROM WHICH HOUSEHOLDS WERE SELECTED FOR THE FIELD HEALTH SURVEY OF ADULT RESIDENTS: A (HIGH EXPOSURE, RED); B (MODERATE EXPOSURE, YELLOW); AND C (COMPARISON, BACKGROUND, GREEN). CROSS-SECTIONAL SUBJECT LOCATIONS ARE NOT SHOWN TO PROTECT THE PARTICIPANTS' CONFIDENTIALITY.

3.3.3 Exposure Definition

For analytical modeling purposes, we defined exposure based on our sampling regions A, B, and C, which denoted residential distance to the railyard as a proxy of exposure to diesel emissions. Three exposure categories were defined: *Exposed*, *High Exposure*, and *Moderate Exposure*. These exposure categories were assigned to participating subjects as follows. First, to define general exposure in our study population, we designated a railyard *exposure zone* (EZ), which included our sampling regions B and A. Thus, study participants who resided in the EZ were classified as *Exposed*. The average distance from subject locations within the EZ to the SBR was 1 mile. Region C served as our comparison or *background* group. The average distance from subject locations in region C to the SBR was 5 miles. *High Exposure* was assigned to study subjects who resided in sampling region A (i.e., the portion of the EZ immediately adjacent to the SBR). Subjects in the *High Exposure* zone were on average less than 0.2 miles from the railyard. *Moderate Exposure* was defined through residence in Region B. Subject locations in the *Moderate Exposure* category were on average 2 miles away from the SBR.

3.3.4 Survey Instrument

A bilingual —English and Spanish— interview instrument was developed by relying on mixed methods research successfully employed by our team and others in the field of public health, to gather information in a culturally competent and linguistically appropriate

manner. The process of developing the survey instrument included an extensive literature review and discussion with scientists (LLU researchers and colleagues from UCLA) to identify an exhaustive list of variables (outcome and potential confounders) to assess; it included internal technical discussions, community feedback obtained through key informant interviews, resident focus groups, and meetings with UCLA researchers who had recently conducted a two-year air pollution sampling study in three communities near railyards in southern California: Long Beach, Commerce/East Los Angeles, and San Bernardino. This process helped us identify relevant questions (from both scientific and community perspectives) to incorporate into our household interviews, such as lived experiences as well as attitudes and perceptions regarding the health impacts of residential proximity to the SBR and possible ideas for solutions.

The survey consists of several sections that include questions pertaining to race/ethnicity, description of household SES, history of doctor-diagnosed illnesses, respiratory symptoms, hearing impairment, health history of household members, use of medications, hospital utilization, occupational and residential histories, lifetime and current stress levels, smoking status/history, perception of community noise levels, and indoor sources of air pollution. Additionally, we added questions on desired community changes focusing on air quality, social stressors, and environmental improvements.

3.3.5 Field Data Collection and Training Activities

A suite of data collection tools was procured and assembled in support of the household survey campaign. During the first phase of the study we used a mobile mapping application that combines tablet PCs, mobile GIS, and GPS. This application enabled field teams to capture the geographic location of sites visited in the field while simultaneously collecting and integrating spatial and questionnaire data without the direct input or manipulation by field staff. The basic set of field tools included ruggedized PC tablets (with integrated mobile GIS software and GPS units), peak expiratory flow meters, and NIOX MINO devices, which collect airway inflammation data via fractional exhaled nitric oxide (FE_{NO}). Detailed protocols on the use of the equipment were also developed and attached to each set of field tools.

Early in the study, and simultaneously with our IRB application, we developed the necessary training and research protocols targeted at research assistants and community partners. All field teams received IRB training as well as hands-on training on field data collection protocols as well as the use of the field equipment. Representatives from Aerocrine, the company that manufactures the NIOX MINO devices, also participated in the training sessions to ensure that all team members achieved adequate proficiency in the handling and use of the equipment. The training included all field research procedures, ranging from appropriate interviewing techniques and safety protocols to data recording. During the training sessions participants received audiovisual presentations, participated in hands-on and “mock” field exercises, and were supplied with ample written documentation in English and Spanish which detailed all research protocols and procedures. By the end of the training activities, all members of the field teams were supplied with the necessary equipment and written documentation. By the end of May 2011, the field teams had

participated in several pilot tests and provided feedback from those experiences, which was used to fine-tune the survey protocols and field protocols. A final 3-day training session took place in early June in order to review and test all data collection protocols once more with the field teams. The actual data collection effort began in the last week of June, 2011.

Data on self-reported clinical symptoms and adverse health outcomes were collected via household questionnaires. After obtaining IRB approval, the first cross-sectional wave of data collection took place from July through October 2011. The second cross-sectional wave of data collection occurred from March through May 2012. During the two waves of field data collection, we collected surveys from 1,075 households: 346 in region A, 355 in region B, and 374 in region C.

We collected information on health outcomes including diagnoses of asthma by a health professional, relative frequency and severity of respiratory symptoms, health care utilization, and disease-related quality of life impact. We also assessed each study subject for airway inflammation through $F_{E_{NO}}$ using a portable NIOX MINO® instrument (Aerocrine AB, Solna, Sweden), which has been approved by the FDA as a diagnostic tool for airway inflammation. Nitric oxide (NO) in exhaled breath reflects the redox state of the airway and is a biomarker of lung tissue injury and inflammation. Lung function was assessed through PEF measurements using portable Mini-Wright devices (Clement Care, London, UK). The highest of three readings was used in analyses after having been transformed into the percent of the predicted PEF according to the subject's height, age, and gender.

Using GIS techniques, we created indicators of outdoor exposures. Residential proximity to the nearest major road (≤ 100 m, 100-200 m, > 200-300 m, and > 300 m) as proxy for traffic-related air pollution exposures was derived in a GIS by linking the residents' residential locations to the transportation network. To account for exposures to diesel PM emissions from local sources, we used data from the Multiple Air Toxics Exposure Study III (MATES-III), a regional emissions gridded inventory of air toxics developed by the SCAQMD [129]. A 2 km x 2 km GIS raster data set was created to store the MATES data. The combined diesel PM (kg/day) emissions from local stationary, on-road, and off-road sources, excluding emissions from the railyard, were computed for each 2-km x 2-km cell. The residents' address locations were linked to the raster data set in order to assign total diesel PM emissions to each study participant.

3.3.6 Statistical Analyses

Log-binomial regression models were used to estimate the effect of residential proximity as a proxy for exposure to SBR excess emissions on prevalence of respiratory symptoms, respiratory illness, CVD, high $F_{E_{NO}}$, and low PEF, adjusting for selected potential confounders. Covariates were selected on an *a priori* basis as likely confounders based on suspected relationships. The included confounders were age, sex, race/ethnicity, season, tobacco use, exposure to ETS, time spent outdoors, neighborhood-level median household income, proximity to major roads, and exposure to diesel PM from local (mobile and stationary) sources. Regression analyses were conducted utilizing SAS version 9.3 (SAS

Institute, Cary, NC). The Multivariate Fractional Polynomial (mfp) package in R was used to assess the best transformation for the covariates included in the models.

3.3.7 Results

General Characteristics

A total of 1,075 San Bernardino adult residents from areas surrounding the SBR participated in the household survey effort conducted in 2011 and 2012 (Fig. 3). The general characteristics of our study population are summarized in **Table 3-1**. Mean age of the ENRRICH Study population was 46. Over two-thirds of participating adults self identified as Hispanics (n = 714) and female participants represented about 70% (n=755) of the adult sample population. Almost half (44%) of participants were married and 43% of the participants had lived at their current address 5 years or longer. The highest level of education achieved for 81% of the sample population combined was some college or less. More than two-fifths of the participants reported to be unemployed and less than 25% worked full time. More than one quarter of the study population reported an annual household income below $10,000.

The three sampling regions included roughly even numbers of participants. There was a recognizable trend for certain baseline characteristics across the three sampling regions coupled with increased residential proximity to the SBR, namely, race/ethnicity, marital status, and residence time, which in some cases reached statistical significance. Noticeably, the representation of Hispanic residents in the study sample increased from the background region outside the RIZ towards the SBR. In sampling region A (high exposure), the proportion of Hispanic residents reached 73%, compared to 59% in region C (background). The number of individuals who were unemployed and had an average household income < $10,000 also increased with residential proximity to the SBR. In contrast, the number of individuals who were married, employed full time, and had an average household income > $30,000 increased as distance from the railyard increased.

Environmental Exposures and Behavioral Factors

As presented in **Table 3-2**, environmental and lifestyle exposure characteristics of participating adults varied by sampling region. On average, our study population was within 3.66 km (approximately 2.3 miles) of the SBR perimeter and 4.6 km (approximately 2.9 miles) from the point of projected maximum impact on the north side of the facility. Survey participants in regions A, B, and C were on average within 283 m (0.18 miles), 3,057 m (1.91 miles), and 7,320 m (4.6 miles), respectively, of the SBR.

TABLE 3-1. DEMOGRAPHICS AND BASELINE CHARACTERISTICS[a] OF PARTICIPATING ADULTS ACCORDING TO SAMPLING REGION (A, B, C) AND CORRESPONDING EXPOSURE LEVEL.

Characteristic	All Subjects (N=1,075) No. (%)	A-*High Exposure* N=346 No. (%)	B-*Moderate Exposure* N=355 No. (%)	C-*Background* (Comparison) N=374 No. (%)
Age *(Mean ± Std. Dev.)*	46.2 ± 58.9	44.8 ± 43.5	43.6 ± 43.0	50.1 ± 44.5
Race/Ethnicity*				
White	101 (9.4)	17 (4.9)	33 (9.3)	51 (13.6)
Hispanic	714 (66.4)	254 (73.4)	238(67.0)	222(59.4)
African American	106 (9.9)	18 (5.2)	51 (14.4)	37(9.9)
Other	13 (1.2)	1 (0.3)	6 (1.7)	6 (1.6)
Gender				
Female	755 (70.2)	229 (66.2)	257 (72.4)	269 (71.9)
Male	320 (29.8)	117 (33.8)	98 (27.6)	105 (28.1)
Highest Education				
Grade School/Less	275(25.6)	84 (24.3)	106 (29.9)	85 (22.7)
High School/Cert.	331(30.8)	116 (33.5)	109 (30.7)	106 (28.3)
Some College	273 (25.4)	79 (22.8)	93 (26.2)	101 (27.0)
Associates/Bachelor	73 (6.8)	18 (5.2)	28 (7.9)	27 (7.2)
Masters/Doctoral	10 (1.0)	5 (1.4)	4 (1.1)	1 (0.3)
Marital Status†				
Single	286 (26.6)	90 (26.0)	104 (29.3)	92 (24.6)
Married	470 (43.7)	141 (40.8)	157 (44.2)	172 (46.0)
Divorced/Separated/ Widowed	133 (12.4)	44 (12.7)	48 (13.5)	41 (11.0)
Live Together	79 (7.4)	29 (8.3)	32 (9.0)	18 (4.8)
Primary Language				
English	442 (41.1)	126 (36.4)	167 (47.0)	149 (39.8)
Spanish	521 (48.5)	178 (51.4)	172 (48.5)	171(45.7)
Other	9(1.0)	1 (0.3)	3 (1.0)	5 (1.3)
Time at Current Address*				
<1 year	59 (5.5)	18 (5.2)	33 (9.3)	8 (2.1)
1-<5 years	443 (41.2)	114 (32.9)	180 (50.7)	149 (39.8)
5-10 years	206 (19.2)	65 (18.8)	67 (18.9)	74 (19.8)
11+ years	251 (23.3)	102 (29.5)	58 (16.3)	91 (24.3)
Lifetime	12 (1.1)	8 (2.3)	2 (1.0)	2 (0.5)
Employment Status				
Unemployed	454 (42.2)	146 (42.2)	160 (45.1)	148 (39.6)
Part time	119 (11.1)	43 (12.4)	42 (11.8)	34 (9.0)
Full time	263 (24.5)	76 (22.0)	85 (23.9)	102 (27.2)
Retired	89 (8.3)	27 (7.8)	37 (10.4)	25 (6.7)
Student	34 (3.2)	9 (2.6)	14 (3.9)	11 (2.9)
Average Household Income				
<10,000	291 (27.1)	107 (30.9)	102 (28.7)	82 (21.9)
10,000-<30,000	356 (33.1)	120 (34.7)	119 (33.5)	117 (31.3)
30,000-<50,000	140 (13.0)	27 (7.8)	64 (18.0)	49 (13.1)
50,000-<74,000	41 (3.8)	8 (2.3)	15 (4.2)	18 (4.8)
74,000+	16 (1.5)	3 (1.0)	8 (2.3)	5 (1.3)

[a] Some columns may not add to 100% due to missing data; *P < 0.05; †P < 0.1.

TABLE 3-2. EXPOSURE CHARACTERISTICS OF PARTICIPATING ADULTS ACCORDING TO SAMPLING REGION (A, B, C) AND CORRESPONDING EXPOSURE LEVEL (*HIGH*, *MODERATE*, *BACKGROUND*).

Indicator	All Subjects N=1,075	A-*High Exposure* N=346	B-*Moderate Exposure* N=355	C-*Background* (Comparison) N=374
Distance to Railyard (m)				
Mean (Std. Dev.)	3,662 (3,352)	283 (206)	3057 (1486)	7320 (2478)
Min.- Max.	3 - 16,301	3 - 1,018	465 -16,301	3,482 - 13,911
Distance to PMI[b] (m)				
Mean (Std. Dev.)	4,624 (3,465)	1,085 (589)	3,9921 (1,329)	8,453 (2,492)
Min.-Max.	79 - 16,778	79 - 2,865	1,521 - 16,778	4,567 - 15,010
Other Exposure Indicators, No. (%)				
Currently Smoking				
Yes	173 (16.1)	44 (12.7)	74 (10.4)	55 (14.7)
No	740 (68.8)	224 (64.7)	262 (73.8)	254 (67.9)
Live with a Smoker†				
Yes, currently	33 (3.1)	7 (2.0)	8 (2.3)	18 (4.8)
Yes, previously	206 (19.2)	43 (12.4)	93 (26.2)	70 (18.7)
Never	642 (59.7)	203 (58.7)	216 (60.8)	223 (59.6)
Household Heating[a]				
None	85 (7.9)	36 (10.4)	25 (7.0)	24 (6.4)
Only Fireplace	56 (5.2)	13 (3.8)	28 (7.9)	15(4.0)
Natural Gas	771 (71.7)	234 (67.6)	281 (79.2)	256 (68.4)
Other	19 (1.8)	4 (1.2)	8 (2.3)	7 (1.9)
Household Cooling[a]				
Open Windows†	318 (29.6)	92 (26.6)	105 (29.6)	121 (32.4)
*Window Unit***	302 (28.1)	136 (39.3)	100 (28.2)	66 (17.6)
*Central Air condition***	384 (35.7)	92 (26.6)	124 (34.9)	168 (44.9)
Portable/Ceiling Fan	328 (30.5)	95 (27.5)	116 (32.7)	117 (31.3)
Other	25 (2.3)	10 (2.9)	7 (2.0)	8 (2.1)
Drink Alcoholic Beverages				
Yes	261 (24.3)	79 (22.8)	100 (28.2)	82 (21.9)
No	649 (60.4)	188 (54.3)	229 (64.5)	232 (62.0)
Fruit < 3 Times/wk*				
Yes	876 (81.5)	279 (80.6)	304 (85.6)	293 (78.3)
No	75 (7.0)	22(6.4)	30 (8.5)	23 (6.1)
Eat Vegetables < 3 Times/wk*				
Yes	875 (81.4)	276 (79.8)	307 (86.5)	292 (78.1)
No	71 (18.6)	26 (7.5)	23 (3.7)	22 (5.9)

[a] Column percent may add to over 100% due to subjects answering yes to more than one category of heating or air conditioning types for their household.

[b] PIM = Point of Maximum Impact (located on the north side of the SBR).

*P < 0.05; **P < 0.0001; †P < 0.1.

Statistically significant differences across sampling regions were found for passive smoking (i.e., living with a smoker), type of house cooling system, and consumption of fruits and vegetables. Compared to regions A and B, sampling region C (background) had slightly higher prevalence of current smoking. Residents in region A, the closest to the SBR, were less likely to live or have lived with a smoker compared to regions B and C. Residents in B were the most likely to live or have lived with a smoker. The number of households with central air conditioning systems noticeably decreased with increasing residential proximity to the railyard, while the opposite is true of households with window A/C units. Consumption of fruits and vegetables falls with increased residential proximity to the SBR. The sharpest contrast with respect to alcohol and fruit/vegetable consumption patterns was between residents in regions C and B.

Distribution of Respiratory and Non-Respiratory Outcomes

Data on self-reported respiratory related symptoms as well as on PEF and airway inflammation results are presented in **Table 3-3**. Respiratory tests identified 38% (n=352) of all subjects with low PEF (< 80% of the predicted value, adjusted for gender, age and height). Intermediate to high FE_{NO} values (≥ 25 ppb) were detected for 19% of study participants (n = 178). Nearly one fifth of all subjects reported a doctor-diagnosed respiratory illness (asthma, bronchial conditions, emphysema) and 10% use a physician-prescribed inhaler. With respect to self-reported respiratory symptoms, close to one-third of all subjects (n = 346) experienced frequent morning or nighttime coughing, 40% (n = 429) said they experienced shortness of breath, 27% (n = 288) reported frequent sputum or mucus from lungs, 28% (n = 303) exhibited wheezy breathing, and almost 20% (n = 210) had a doctor-diagnosed respiratory condition. No statistically significant differences across the sampling regions were found for the respiratory outcomes and symptoms. Regions A and B are relatively close to each other and in some cases region B, although slightly further from the SBR, reports worse health statistics for some of the variables than regions A and C.

The values for participants' self-reported non-respiratory related health characteristics shown in **Table 3-4** illustrate an interesting relationship between the subjects' description of their general health status and increasing residential proximity to the railyard. The number of participants who said their health status is "fair" or "poor" rose with increasing residential proximity to the railyard, while the number of those describing their general health to be "good" or "excellent" increased in the opposite direction (i.e., away from the SBR). Compared to regions B and A, region C's residents tended to report better self-described health status and access to health care services. With the exception of migraines, region C had lower proportions of chronic health conditions including high cholesterol, diabetes, high blood pressure, and allergies. These differences were statistically significant.

Perceptions of Residential Community Characteristics

We also surveyed households regarding perceptions among adult residents about the social and physical conditions of the community. Results of several community indicators are shown in **Table 3-5.** Differences across sampling regions A, B, and C, for most

TABLE 3-3. RESULTS FROM THE BIOLOGICAL TESTS, SELF-REPORTED RESPIRATORY SYMPTOMS, AND DOCTOR-DIAGNOSED RESPIRATORY CONDITIONS OF PARTICIPATING ADULTS BY SAMPLING REGION (A, B, C) AND CORRESPONDING EXPOSURE LEVEL (HIGH, MODERATE, BACKGROUND).

Outcome/Symptom	All Subjects (N=1,075) No. (%)	A-*High Exposure* (N=346) No. (%)	B-*Moderate Exposure* (N=355) No. (%)	C-*Background* (Comparison) (N=374) No. (%)
BIOLOGICAL TEST				
Peak Expiratory Flow (PEF)[a]				
< 80 % of predicted	352 (37.8)	117 (41.1)	119 (36.2)	116 (36.6)
Airway inflammation (FE_{NO})[b]				
NO ≥ 25 ppb	177 (18.9)	56 (19.6)	55 (16.6)	66 (20.7)
SELF-REPORTED RESPIRATORY SYMPTOMS AND CONDITIONS				
Frequent cough (morning/night)	341 (31.7)	106 (30.6)	127 (35.8)	108 (28.9)
Frequent sputum/mucus	288 (26.8)	95 (27.5)	105 (29.6)	88 (23.5)
Wheezy breathing	303 (28.2)	94 (27.2)	115 (32.4)	94 (25.1)
Shortness of breath	429 (39.9)	121 (35.0)	167 (47.0)	141 (37.7)
Doctor-diagnosed respiratory illness	210 (19.5)	63 (18.2)	79 (22.3)	68 (18.2)
Physician-prescribed inhaler use	111 (10.3)	29 (8.4)	46 (13.0)	36 (9.6)
Recently ER visit for respiratory/heart reasons	119 (11.1)	34 (9.8)	48 (13.5)	37 (9.9)
Recently hospitalized for respiratory/heart condition	75 (7.0)	22 (6.4)	27 (7.6)	26 (7.0)

[a] Percentages for each region are based on the number of people from each zone who were able to perform the peak expiratory flow (PEF) test: (A =285, B =329, C =317).
[b] Percentages for each region are based on the number of people from each zone who were able to perform the fractional exhaled nitric oxide (FE_{NO}) test: (A =286, B =331, C =319).

TABLE 3-4. SELF-REPORTED NON-RESPIRATORY HEALTH INDICATORS AND OUTCOMES OF PARTICIPATING ADULTS BY SAMPLING REGION (A, B, C) AND CORRESPONDING EXPOSURE LEVEL (HIGH, MODERATE, BACKGROUND).

Indicator/Outcome	All Subjects (N=1,075) No. (%)	A-*High Exposure* N=346 No. (%)	B-*Moderate Exposure* N=355 No. (%)	C-*Background* (Comparison) N=374 No. (%)
Subject's description of general health status				
Excellent	101 (9.4)	27 (7.8)	36 (10.1)	38 (10.2)
Good	417 (38.8)	119 (34.4)	160 (45.1)	138 (36.9)
Fair	357 (33.2)	133 (38.4)	104 (29.3)	120 (32.1)
Poor	74 (6.9)	21 (6.1)	32 (9.0)	21 (5.6)
Place usually go for medical visits[a]				
Don't go	209 (19.4)	72 (20.8)	70 (19.7)	67 (17.9)
Doctor's office	620 (57.7)	189 (54.6)	220 (62.0)	211 (56.4)
County clinic	130 (12.1)	43 (12.4)	43 (12.1)	44 (11.8)
Emergency Room	136 (12.7)	23 (6.6)	69 (19.4)	44 (11.8)
*Other**	7 (0.7)	1 (0.3)	6 (1.7)	0 (0.0)
Diagnosed with any of the following conditions:[a]				
High Cholesterol†	212 (19.7)	79 (22.8)	69 (19.4)	64 (17.1)
Diabetes†	152 (14.1)	52 (15.0)	56 (15.8)	44 (11.8)
Stroke	11 (1.0)	2 (0.6)	4 (1.1)	5 (1.3)
Angina	20 (1.9)	4 (1.2)	10 (2.8)	6 (1.6)
*High B.P.**	259 (24.1)	86 (24.9)	97 (27.3)	76 (20.3)
*Allergies**	182 (16.9)	56 (16.2)	74 (20.8)	52 (13.9)
Migraines	117 (10.9)	30 (8.7)	42 (11.8)	45 (12.0)
Experienced ringing one/both ears	418 (38.9)	126 (36.4)	157 (44.2)	135 (36.1)
Physician-diagnosed hearing loss	76 (7.1)	27 (7.8)	23 (6.5)	26 (7.0)
Medical services needed in past 12 months, but couldn't access†	229 (21.3)	78 (22.5)	86 (24.2)	65 (17.4)
Medications needed in past 12 months, but couldn't get	158 (14.7)	44 (12.7)	63 (17.7)	51 (13.6)

[a] Column percent may add to over 100% due to subjects answering yes to more than one category of heating or air conditioning types for their household.

*P < 0.05; †P < 0.1.

indicators were statistically significant. In general, negative community perceptions increased with increasing residential proximity to the railyard, from the comparison region C to the exposure regions B and A. This trend was particularly evident in perceptions related to community nuisances such as violence, heavy traffic, or sleep disturbance. For instance, while 44% of those surveyed in region C agree or strongly agree that violence is not a problem in their neighborhood, only 28% feel that way in region A, and 35% in region B. Conversely, the proportion of those who perceive violence as a problem reaches 47% in region A, but only 26% in region C.

Although less pronounced, the differences with respect to perceptions of neighborhood traffic across sampling regions mimic the trend observed for community violence. Almost 20% more respondents in region A, compared to region C, agree or strongly agree that heavy traffic is characteristic of their neighborhood. The proportion (43%) of those surveyed in region A who agree or strongly agree that community noise disturbs their sleep at night more than doubled the proportion (18%) of participants in region C who reported the same concern. A similar trend, with more residents perceiving more favorable conditions away from the railyard, was observed with respect to local exercise facilities and ample opportunities offered to exercise; shade afforded by trees; and availability and selection of fruits and vegetables.

Association Between Residential Proximity to the SBR and Health Outcomes

Exposed subjects, i.e., those residing in the REZ, had higher prevalence ratios for all health endpoints assessed after adjusting for age, sex, race/ethnicity, season, tobacco use, exposure to Environmental Tobacco Smoke (ETS), time spent outdoors, neighborhood-level median household income, proximity to major roads, and diesel emissions from local sources (**Table 3-6)**. The strongest associations were observed for self-reported respiratory symptoms (cough, wheeze, shortness of breath, and sputum), PR = 1.20, followed by self-reported, doctor-diagnosed respiratory illness (asthma, bronchial conditions, emphysema, or use of physician-prescribed inhaler), PR = 1.17, and CVD (angina, high blood pressure, high cholesterol, and stroke), PR = 1.15. The weakest associations overall were found for low PEF and intermediate-to-high F_{ENO} (≥ 25 ppb), PR = 1.06 and PR = 1.08, respectively. The observed associations for respiratory symptoms and CVD were borderline significant.

Suggestive of a dose-response trend, the associations strengthened with the intensification of exposure (i.e., with increased proximity to the railyard, from the *Moderate* to *High* exposure zones) for respiratory symptoms, respiratory conditions, F_{ENO}, and low PEF. However, this was not the case for CVD, as the elevation of this endpoint was greater in the *Moderate* exposure region than in the *High* exposure areas: PR = 1.14 *vs*. PR = 1.07. Across endpoints and exposure levels, elevations were modest, ranging from small (low PEF, PR = 1.06) to moderate (respiratory symptoms, PR = 1.26).

TABLE 3-5. PERCEPTION OF RESIDENTIAL COMMUNITY CHARACTERISTICS AMONG PARTICIPATING ADULTS BY SAMPLING REGION (A, B, C) AND CORRESPONDING EXPOSURE LEVEL (HIGH, MODERATE, BACKGROUND).

Indicator	All Subjects (N=1,075) No. (%)	A-*High Exposure* N=346 No. (%)	B-*Moderate Exposure* N=355 No. (%)	C-*Background* (Comparison) N=374 No. (%)
Violence is not a problem in my community**				
Strongly agree	130 (12.1)	40 (11.6)	37 (10.4)	53 (14.2)
Agree	256 (23.8)	56 (16.2)	89 (25.1)	111 (29.7)
Disagree	233 (21.7)	89 (25.7)	88 (24.8)	56 (15.0)
Strongly disagree	166 (15.4)	72 (20.8)	54 (15.2)	40 (10.7)
I often see children playing outside				
Strongly agree	239 (22.2)	70 (20.2)	88 (24.8)	81 (21.7)
Agree	439 (40.8)	149 (43.1)	142 (40.0)	148 (39.6)
Disagree	114 (10.6)	36 (10.4)	46 (13.0)	32 (8.6)
Strongly disagree	50 (4.7)	21 (6.1)	14 (3.9)	15 (4.0)
My community has heavy traffic†				
Strongly agree	182 (16.9)	72 (20.8)	62 (17.5)	48 (12.8)
Agree	252 (23.4)	77 (22.3)	90 (25.4)	85(22.7)
Disagree	249 (23.2)	73 (21.1)	82 (23.1)	94 (25.1)
Strongly disagree	57 (5.3)	18 (5.2)	15 (4.2)	24 (6.4)
A large selection of fruits and vegetables are available in my community				
Strongly agree	251 (23.3)	70 (20.2)	84 (23.7)	97 (25.9)
Agree	507 (47.2)	148 (42.8)	189(53.2)	170 (45.5)
Disagree	77 (7.2)	33 (9.5)	23 (6.5)	21 (5.6)
Strongly disagree	34 (3.2)	18 (5.2)	7 (2.0)	9 (2.4)
The trees in my community provide enough shade†				
Strongly agree	152 (14.1)	41 (11.8)	65 (18.3)	46 (12.3)
Agree	364 (33.9)	99 (28.6)	141 (39.7)	124 (33.2)
Disagree	185 (17.2)	74 (21.4)	54 (15.2)	57 (15.2)
Strongly disagree	105 (9.8)	48 (13.9)	29 (8.2)	28 (7.5)
Local facilities offer many opportunities to get exercise*				
Strongly agree	139 (12.9)	44 (12.7)	39 (11.0)	56 (15.0)
Agree	264 (24.6)	66 (19.1)	99 (27.9)	99 (26.5)
Disagree	233 (21.7)	78 (22.5)	95 (26.8)	60 (16.0)
Strongly disagree	135 (12.6)	48 (13.9)	48 (13.5)	39 (10.4)
The noise in my community keeps me awake/wakes me up at night**				
Strongly agree	110 (10.2)	67 (19.4)	22(6.2)	21 (5.6)
Agree	173 (16.1)	81 (23.4)	47 (13.2)	45 (12.0)
Disagree	381 (35.4)	86 (23.9)	169 (47.0)	128 (34.2)
Strongly disagree	184 (17.1)	29 (8.4)	64 (18.0)	91 (24.3)

*P < 0.05; **P < 0.0001; †P < 0.1.

TABLE 3-6. ADJUSTED[a] PREVALENCE RATIOS OF THE ASSOCIATION BETWEEN RESIDENTIAL PROXIMITY TO THE SAN BERNARDINO RAILYARD AND RESPIRATORY AND CARDIOVASCULAR HEALTH OUTCOMES.

	Respiratory Symptoms[b] (n = 739)	Respiratory Illness[c] (n = 739)	Peak Expiratory Flow < 80%[d] (n = 728)	FE_{NO} ≥ 25 ppb[e] (n = 712)	Cardiovascular Disease[f] (n = 739)
Railyard Exposure[g]			PR (95% CI)[h]		
Exposed	1.20 (0.97, 1.48)	1.17 (0.87, 1.56)	1.06 (0.86, 1.32)	1.08 (0.76, 1.56)	1.15 (0.96, 1.37)
High	1.26 (0.97, 1.64)	1.21 (0.85, 1.72)	1.07 (0.83, 1.39)	1.21 (0.79, 1.85)	1.07 (0.88, 1.31)
Moderate	1.17 (0.93, 1.47)	1.16 (0.85, 1.58)	1.06 (0.84, 1.34)	1.01 (0.68, 1.51)	1.14 (0.96, 1.36)
Background	1.00 (referent)	1.00 (referent)	1.00 (referent)	1.00 (referent)	1.00 (referent)

[a] Covariates included in the model: Age, sex, race (Hispanic/Not Hispanic), season, tobacco use (current smoking), ETS exposure, time spent outdoors, neighborhood median household income, proximity to major roads (< 300 m from major roadway) , and total diesel particulate matter (kg/day) from local (mobile and stationary) sources.
[b] Includes self-reported: Cough, wheeze, shortness of breath, and sputum.
[c] Includes doctor-told: Asthma, bronchial conditions, emphysema, or use of physician-prescribed inhaler.
[d] Measured peak expiratory flow less than 80% of predicted value based age, gender, and height.
[e] Intermediate to high measured FE_{NO} (fractional exhaled nitric oxide): ≥ 25 ppb.
[f] Doctor-told cardiovascular condition: Angina, high blood pressure, high cholesterol, and stroke.
[g] See *Methods* section for the derivation of the exposure categories: Exposed (mean residential distance to railyard = 1 mile); High (mean residential distance to railyard < 0.2 miles); Moderate (mean residential distance to railyard < 2 miles).
[h] Prevalence Ratio (95% confidence interval) per change in residential exposure category with respect to background exposure (i.e., residence in neighborhoods bordering the *railyard impact zone* as defined in the California Air Resources Board Health Risk Assessment; mean residential distance to railyard < 5 miles).

3.3.8 Discussion

We explored the health risks of living in close proximity to the SBR, a goods movement rail hub, in an urbanized area of inland southern California. Specifically, we assessed the relationship between air pollution near and further away from the facility and adverse health effects among nearby adult residents in an area already impacted by regional air pollution. Residential proximity to the railyard was used as a proxy of exposure to excess railyard diesel emissions. We collected individual-level data for a relatively large, diverse, and representative population sample in the neighborhoods surrounding the SBR. Two waves of household surveys were conducted in the summer and winter to capture the potential differential impact of exposures to regional air pollutants whose concentrations vary seasonally.

Our results show that residing in close proximity to the railyard had small but detectable effects on the prevalence of respiratory and cardiovascular outcomes in adults. Our study adds to the growing body of research that links exposure to traffic and transportation corridors and is novel because of its focus on a major goods movement railyard.

There are several limitations to our study that should be considered. Outcomes were determined and analyses were conducted cross-sectionally. Therefore a cause-effect relationship cannot be established. Another limitation is that residential proximity, i.e., distance to the SBR estimated from the subjects' street address, acts as a surrogate measure for diesel exhaust concentrations, which may lead to the possibility of misclassification of railyard-related air pollution exposure. However, this was the most feasible way of characterizing exposure in our large population sample and in the absence of a dense network of air monitors across our sampling regions, and any non-differential misclassification would tend to bias our results toward the null.[xix] Our definitions of respiratory disease and symptoms were based on self-report, which may also result in misclassification, but questionnaire-based reporting of asthma and other respiratory conditions is widely established in epidemiological studies of respiratory risk.[xx] In addition to self-reported health endpoints, we also collected data on two biological outcomes, PEF and $F_{E_{NO}}$, which were directly measured on each subject.

The adult outcomes are not as clear and strong as those observed in our study of childhood respiratory health risk. However, there is a trend toward higher prevalence of adverse respiratory health endpoints among persons living in the railyard exposure zone in comparison with the background region further away. Despite its relatively small size (approximately 11,500 acres), we detected variations in the prevalence of the

[xix] Bias towards the null implies that if there is an association between exposure to railyard emissions and a given health outcome, it tends to minimize it regardless of whether it is a positive or negative association. See Vogel C, Gefeller O. Implications of nondifferential misclassification on estimates of attributable risk. Methods Inf Med. 2002; 41(4):342-8.

[xx] On the issue of using questionnaires for asthma assessments, see for example: Remes ST, Pekkanen J, Remes K, Salonen RO, Korppi M. In search of childhood asthma: questionnaire, tests of bronchial hyperresponsiveness, and clinical evaluation. Thorax. 2002 Feb;57(2):120-6.

outcomes within the REZ. There was a trend of increased prevalence of self-reported respiratory outcomes, low PEF, and intermediate-to-high F_{ENO} from the *Moderate* to the *High* exposure regions. In contrast, the prevalence of CVD was higher in the *Moderate* exposure zone than in the *High* exposure region. As noted earlier, the results were not statistically significant, although some of the associations were borderline significant.

Pervasively high levels of background, transported air pollution and emissions from local sources, together with underlying respiratory health challenges and relative socioeconomic/ethnic homogeneity, define an overall exposure setting within which it may be difficult to find a distinct pattern of adverse outcomes with respect to residential proximity to the SBR. We nevertheless were still able to detect elevations with respect to increasing proximity to the SBR, which were consistent across outcomes. This trend appears to fit the expectation of enhanced exposures in the areas near the facility. The SBR is the largest local emitter of diesel PM. In addition, emerging results from a study recently conducted by UCLA scientists indicate that pro-oxidant activity (i.e., cellular oxidative stress), which will lead to adverse health effects, was greater in ambient air samples collected near the SBR compared to samples taken at the Long Beach and Commerce railyards. This finding implies increased toxicity of the air pollution to which local residents near the SBR are exposed.

Our models adjusted for relevant confounders, including age, sex, race/ethnicity, neighborhood-level household income, exposure to ETS, tobacco use, time spent outdoors, proximity to traffic, and diesel emissions from local (mobile and stationary) sources. The fact that even after analytical adjustments we still found modest to moderate elevations across health endpoints does not appear to support the basic hypothesis of no association between residential proximity to the railyard and adverse health outcomes.

CHAPTER 4: SCHOOL-BASED ASSESSMENT OF RESPIRATORY HEALTH

To more comprehensively understand how proximity to a major goods movement rail facility may impact the respiratory health of nearby residents we also conducted a respiratory health assessment of children. Young children have developing respiratory systems and are likely more sensitive to the impact of the additional air pollution from the railyard.

To reach large numbers of children for both exposure and background locations, we conducted health assessments with children at two elementary schools—one located in the high exposure region, adjacent to the SBR, and a socio-demographically matched comparison school several miles away, outside the RIZ. The target school is under the jurisdiction of the San Bernardino City Unified School District (SBCUSD), while the comparison school is under the jurisdiction of the Fontana Unified School District (FUSD). The main purpose of the school assessment was to gather data on the prevalence of respiratory disease and symptoms as well as on biologic outcomes (peak expiratory flow and airway inflammation). All children who attended one of the schools and had active parental consent to participate were included in the study. The start of the school health assessment work was delayed from its planned start date due to unexpected problems with the approval process by one of the school districts. By early December 2011, however, both school districts involved had approved their participation in the health study without reservation. Data collection for the two schools was aligned in time (winter season) to assure similarity in seasonality and weather. Data collection took place on Feb 21-24 at the exposure school and during Feb 27-29 at the comparison school. We decided to collect data in winter since this is usually the "good" air quality season, and thus would give us conservative estimates of impacts of the regional air pollution on the children's health. The school screenings were carried out in partnership with the San Bernardino County's Arrowhead Regional Medical Center Breathmobile® Program. Children who required follow up medical care were referred to the Breathmobile® asthma program.

4.1 Biological Outcomes Assessment

Once the health screening data from the two participating elementary schools were collected and the resulting data set augmented with potential confounding variables, we analyzed results to assess if the proximity of school children to the major railyard increases the likelihood of adverse respiratory health outcomes. The findings from the assessment of the biological tests (including PEF and F_{ENO}) have recently been submitted as a manuscript to *Environmental Health Perspectives*, detailing the results. We have inserted the full manuscript below. In addition to the submitted text, we have also included an additional section on respiratory health endpoints obtained through the school assessment.

Schoolchildren's Respiratory Health and Proximity to a Major Goods Movement Railyard: The ENRRICH Project

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SHORT RUNNING TITLE

Railyard Proximity and Children's Respiratory Health

KEY WORDS: air pollution, children, respiratory, railyard, goods movement

ACKNOWLEDGEMENTS

This research was funded by the SCAQMD/BP West Coast Products Oversight Committee, LLC grant # 659005 and by NIH # P20MD006988. We thank the Arrowhead Regional Center Breathmobile® for collaborating with Project ENRRICH and the Aerocrine Corporation for donating additional NIOX tests. We are also grateful to Drs. J. Ospital and T. Chico, from the SCAQMD, for providing the MATES emissions data.

COMPETING INTERESTS

The authors have not published or submitted any related papers from this same study. The authors have no financial conflict of interest.

Abstract

Background: Inland Southern California is a region of public health concern, especially for children, given the area's perennially poor air quality and increasing sources of local pollution. An elementary school is located only a few hundred yards from the San Bernardino Railyard, one of the busiest goods movement facilities in California, potentially increasing respiratory problems.

Objectives: Through the ENRRICH (**En**vironmental **R**ailyard **R**esearch **I**mpacting **C**ommunity **H**ealth) Project, we assessed the association of proximity to a major railyard with respiratory health in schoolchildren.

Methods: With parental approval, we provided respiratory screening for children at two elementary schools: one in close proximity to the railyard and a socio-demographically matched comparison school seven miles away. Screening included testing for airway inflammation (FE_{NO}) and lung function (peak expiratory flow, PEF). Parental questionnaires collected demographic and other information. Log-binomial and linear regression were used to assess association.

Results: Compared to children in the comparison school, children attending school near the railyard were more likely to exhibit airway obstruction with higher prevalence of abnormal PEF (<80%): Prevalence Ratio (PR) = 1.59 (95% CI: 1.19-2.12). The association with inflammation was less clear. While children at the exposure school, who had lived for at least 6 months at their current address, were more likely to have values suggesting inflammation (FE_{NO} >20 ppb) (PR=1.44, 95% CI: 1.02-2.02), an elevation but no significant association found through linear regression.

Conclusion: Our findings suggest children attending school and residing in close proximity to a major railyard have significantly higher airway obstruction and possibly increased airway inflammation.

Background

The overall impacts of international trade and the accompanying nationwide movement of goods are generally seen as positive as they are believed to promote employment opportunities and cheaper goods. Relatively little attention has been given to possible health threats to the communities crisscrossed by segments of the complex goods movement system. Residents living near major transportation hubs and corridors are likely to be exposed to high levels of airborne pollutants, which have been associated with the exacerbation of airway inflammation and respiratory disease [130]. Scientific evidence has linked exposure to traffic-related air pollution to reproductive and cardiovascular disease effects, as well as increased respiratory symptoms, increased asthma-related hospitalizations, and higher incidence of asthma [95-97, 131, 132]. Exposure to diesel exhaust in particular has been associated with adverse respiratory symptoms and clinical outcomes [31, 133, 134]. Health risks are even greater for children, a subpopulation considered especially vulnerable to the health effects of air pollution with respect to the exacerbation and initial development of childhood asthma [29, 135, 136].

In California, many minority or low-income children live near transportation corridors and hubs [7]. The California Air Resources Board (CARB) has recently conducted a series of health risk assessments focusing on 18 major freight railyards, which ranked the San Bernardino Railyard (SBR) first in California in potential cancer risk, due to the large population living in the immediate vicinity, and fifth in terms of emissions [13]. The SBR is a component of the massive Los Angeles-Long Beach port complex and its associated inland trade centers, distributing nearly half of the nation's imported goods to the rest of the country.

In light of concerns regarding the enhanced risk of exposure to particulate matter (PM) and other harmful air pollutants among children growing up near the SBR, the primary aim of this research was to explore the association between respiratory function and airway inflammation in schoolchildren relative to their proximity to the facility.

Materials and Methods

Study setting. The SBR is located in a densely populated area in inland southern California characterized by notoriously poor air quality for ozone and particulate pollution. This region has dynamic demographic growth even while facing severe social challenges and a weakened economy. The areas which surround the SBR are home to predominantly young, low-income, Hispanic populations.

Emission sources at this 24/7 railyard facility include locomotives, on-road and off-road machinery, and vehicles. Diesel PM (DPM) is the dominant toxic air contaminant although other air toxics (e.g., benzene and 1,3-butadiene) are also emitted in small amounts [13]. CARB has estimated the SBR's combined DPM emissions and other significant non-railyard (mobile and stationary) sources within a one-mile radius of the facility at 33 tons per year (t/yr) [13]. As depicted in Figure 1, 65% of the facility-wide emissions occur along the northern yard. The total area impacted by DPM emissions encompasses approximately 62,000 acres surrounding the SBR. Within this impact zone, DPM concentrations are greatest near the SBR and gradually subside over distance (see Figure 1).

Study design. We used a cross-sectional design to compare two socio-demographically matched schools: the exposure school (ES), located 500 meters downwind from the SBR, and the comparison school (CS), located seven miles west, which was selected after a GIS-based spatial query outside of a CARB-identified railyard impact zone (RIZ) (see Figure 1). The school closest to the same rail lines crossing the SBR was selected from among a group of candidates located in neighborhoods that matched the GIS-derived socio-demographic signature of the community feeding into the ES. Potential confounders were assessed through a number of different methods including: parental survey, Census 2010 data, as well as additional traffic and emission databases. Potential confounding variables were included if they changed the main effect by 10% or more. A description will follow of the covariates that were included.

After obtaining Institutional Review Board (IRB) and school district approval, an explanatory letter, consent form, and a short questionnaire were sent to the parents of children. To start off the study, an assembly in the form of a theatrical play was conducted at each school. School-based respiratory health screenings were conducted in February 2012 with students from grades K-5.

Questionnaire. The parental questionnaire contained questions on socio-demographic variables; home addresses; residential history; potential indoor environmental exposures (tobacco smoke, pets, and types of heating system used in the home); and level of the child's outdoor play. In addition, there was information about the child's respiratory symptoms and past health history.

Screening clinics. Using trained and standardized technicians, children's peak expiratory flow (PEF) and fractional exhaled nitric oxide ($F_{E_{NO}}$) measurements were collected, as were anthropometric measurements to determine each child's body mass index (BMI). The screenings were conducted in partnership with the County's mobile clinic Breathmobile® Program. All children who exhibited respiratory values outside normal PEF range or had a parental survey indicating their child had asthma received additional spirometry testing by the medical staff of the Breathmobile® and were offered follow-up medical care through the mobile clinic.

Peak expiratory flow. PEF was assessed using a peak flow meter (Mini Wright, Medline, Mundelein, Illinois). The highest of three readings was used in analyses after being transformed into the percent of the predicted PEF according to the child's height based on manufacturer's guidelines.

Exhaled nitric oxide determination. Nitric oxide (NO) in exhaled breath reflects the redox state of the airway and has been proposed as a biomarker of lung tissue injury and inflammation [137]. $F_{E_{NO}}$ was measured once with the child in a sitting position using a NIOX MINO® instrument (Aerocrine AB, Solna, Sweden), which has been approved by the FDA as a diagnostic tool for airway inflammation.

Potential confounders. Identification of potential confounders was done through literature review and included:

1) *Confounders considered relevant and included on the parental questionnaire.* Sex (male/ female); age (years); grade; race (non-Hispanic White, non-Hispanic Black, Hispanic, Other); furry pets in the home (yes/no); time spent outdoors (<12 hrs. per week, 12-24 hrs. per week, 24+ hrs. per week); exposure to environmental tobacco smoke (yes/no); type of home heating system (gas, wood burning stove/fireplace,

coal/oil, other); length of time at current address (months); BMI (underweight, normal, overweight and obese); and lack of access to medical care (yes/no).

2) Neighborhood characteristics. Using GIS, we created several variables to characterize population density, housing indicators, and household income at the census block group (BG) level using Census 2010 figures and definitions. These neighborhood-level indicators were assigned to study subjects from both schools according to their residential BG.

3) Traffic exposure. We modeled proximity to major roadways as a proxy for residential and school exposure to traffic emissions. Distance between subjects' residential and school locations to nearest major roads (freeway, highway, and arterials) was estimated through GIS mapping methods described previously [103, 138-140].

4) DPM exposure variables. To account for exposures to DPM emissions from local sources, we used data from the Multiple Air Toxics Exposure Study III (MATES-III), a regional emissions gridded inventory of air toxics developed by the South Coast Air Quality Management District (SCAQMD) [129]. A 2 km x 2 km GIS raster data set was created to replicate the spatial coverage and resolution of the MATES-III inventory. The combined DPM (kg/day) emissions from local stationary, on-road, and off-road sources, were computed for each 2-km x 2-km cell. The geocoded student addresses were linked to the raster data set in order to assign total DPM emissions to each subject. DPM emissions were categorized into 3 groups: 0 to < 7; 7 to <9; and greater than 9 kg/day.

Statistical Analysis. Descriptive and summary estimates were assessed and compared between the two schools using Chi-square and t-tests. The association of school location with the two respiratory health measures, PEF and $F_{E_{NO}}$, was studied separately using linear regression as well as log-binomial regression models for dichotomous outcomes (using established cut-off levels for PEF (< 80% vs 80+) and recommended cut-off levels to assess airway inflammation for $F_{E_{NO}}$ (>=20 vs < 20 ppb), which allowed the calculation of prevalence ratios (PR) and 95% confidence intervals (95% CI). The final model in addition to the school variable included age, gender, race/ethnicity, environmental tobacco smoke (ETS), time spent outdoors, median household income, proximity to nearest major road, and total diesel pollution from local sources. Other covariates described as potential confounders above did not noticeably change the effect of the main exposure and were not included in the final model. An additional set of sensitivity analyses was conducted limiting the study population to students who had lived 6+ months at their current address (N=765). All analyses were conducted utilizing SAS version 9.3 (SAS Institute, Cary, NC).

Results

Of 1,440 children attending the two schools, the parents or guardians of 1,066 (74%) children provided consent for the children to participate and presented themselves for testing; 531 attended the ES and 535 the CS. Two-thirds of participating children lived within < 0.6 miles of their campus and most were Hispanic (83%). Schools were similar with respect to gender, race/ethnicity, BMI category, and time

spent outdoors. Of the 1,066 participating students, 1,065 had acceptable and reproducible PEF data and 1,052 had acceptable and reproducible F_{ENO} data. A total of 877 children (ES, n = 435; CS, n = 442) had complete information on all variables that went into the final analytical model and thus constitute our study population (Table 1). Overall 21% of students had PEF results below 80% of the predicted value and 16.3% had high F_{ENO} values, indicative of airway obstruction and/or lung inflammation, respectively.

The association between respiratory outcomes and proximity to the railyard are shown in Table 2. Both the linear regression and log-binomial regression analysis revealed consistent findings across the crude, adjusted, and sensitivity analysis models, indicating that children from the ES exhibited an increased prevalence of poorer PEF results compared to the comparison school. After adjusting for age, sex, race/ethnicity, ETS, time spent outdoors, median household income, proximity to nearest major road, and local DPM emissions, the ES children experienced a significant 59% increase in the prevalence of reduced PEF compared to the CS children (PR= 1.59, 95% CI: 1.19-2.12). Sensitivity analyses with students who resided 6 months or longer at their current address confirmed the earlier PEF results (PR= 1.41, 95% CI: 1.03-1.92). The findings for F_{ENO} were less clear: no association was found using the linear regression model. However, when using the recommended cutoff of 20 ppb, the children in the ES were 33% more likely to have an abnormal value (PR=1.33, 95% CI: 0.95-1.85) compared to the CS. When limiting the analyses to those who had resided at their current address for at least 6 months, the estimate became stronger and statistically significant (PR=1.44, 95% CI: 1.02- 2.02).

Discussion

This research was part of the ENRRICH Project, developed by LLU researchers, to understand how proximity to a major goods movement rail facility may impact the respiratory health of nearby residents and their children. Specifically, we examined the question of whether pollution density near the railyard had an adverse effect on children's respiratory health, in an area already impacted by regional air pollution, by comparing an elementary school in close proximity to the railyard with a socio-demographically matched school several miles away. Our findings of compromised respiratory function among the children attending the school located close to the source of significant DPM pollution are in line with findings by others [141-144]. Through screening we found that children from the ES had poorer test results (26% with PEF <80% of predicted and 18% with $F_{ENO} \geq$ 20ppb) compared to children from the CS (17% PEF <80% of predicted and 15% $F_{ENO} \geq$ 20ppb), suggestive of reduced lung function and increased airway inflammation respectively. Sensitivity analyses suggest a 41% increase in prevalence of low PEF, indicating a significant increase in airway obstruction and a 44% increase in PR with respect to airway inflammation in children attending the ES. This pattern of adverse effects suggests that proximity to the railyard enhances respiratory risk for children.

Together, both biological respiratory tests provide important information that is not compromised by self-report. Others have used PEF when studying traffic-related air pollution and ambient PM and found significant decreases in PEF values for children associated with increase in air pollutants [145-147]. Additionally, F_{ENO} has been used in

assessing traffic related air pollution and ambient PM [145, 148]. FE_{NO} also has been found to be a sensitive screening method for early respiratory risk of asthma and for assessing asthma aggravation in asthmatic children [149, 150]. Dales et al (2008) found that it may, in fact, be a more sensitive indicator of adverse air pollution effects than traditional measures of ventilatory function [151]. Nickmilder (2007) found signs of inflammation using exhaled nitric oxide even at levels slightly below the current air quality standards in Belgium [152]. In a recent study where children (ages 7-10) were followed for 3 years, those in the highest FE_{NO} quartile had more than a two-fold increased risk of new-onset asthma compared to those with the lowest quartile (hazard ratio 2.1, 95% CI 1.3-3.5) [153]. The effect of elevated FE_{NO} was most apparent among those without a parental history of asthma. Our FE_{NO} average results are higher than those reported by the University of Southern California Children's Study (13.3 ppb vs 10.9 ppb in the USC study) [154].

In gauging the observed differences in PEF and FE_{NO} between the schools, we must ponder four key issues:

(1). Pollutants, sources, and associated health effects. A fundamental issue to be examined is the evidence that the pollutants from freight railyards can be linked to detrimental health effects. Given previous research we expect that our ES children would be exposed to diesel exhaust, a complex mixture of pollutants composed of vapors, gases, and fine particles [155]. In a railyard study in northern California, researchers measured sulfur, very fine metals, and soot, as well as coarse particles in soil samples and polycyclic aromatic hydrocarbon (PAH) species [156]. They found that coarse PM had high concentrations of diesel-associated particles, petroleum-derived *n*-alkanes, and PAHs, and ultrafine (UF) particles and chemical components associated with exhaust had higher downwind concentrations. Ambient PM and DPM have been associated with a variety of respiratory and cardiovascular problems [18, 19, 24, 157, 158]. In addition, traffic emissions and diesel exhaust have been associated with increased risk of adverse respiratory health in children [26, 135, 159, 160].

(2) Mechanisms of action. Diesel exhaust particles are by mass largely less than 2.5 microns ($PM_{2.5}$) and thus are readily respirable, can penetrate deep into a growing child's lungs, and eventually enter systemic circulation. They have also been shown to promote the release of allergic and inflammatory response mediators in the upper and lower airway [161]. Moreover, particles from incomplete combustion of engine fuels and lubricating oils can bypass the body's defense mechanisms, gain entry to cells and tissues, and alter or disrupt normal cellular function [23]. Emerging evidence indicates that the primary etiologic agents from fossil fuels are pro-oxidant pathways and electrophilic activity that leads to irreversible binding with proteins and DNA [162, 163]. Quinones found in DPM have been identified as being highly reactive and seem to play a critical role in eliciting oxidative stress-dependent cellular toxicity in human pulmonary tissue [162].

(3) Pollutant characterization and population exposure. Our exposed setting is complex, resulting from the intersection of local and regional air pollution processes and conditions. For example, the concentration of quinones, the key agents in the toxicity of PAHs, increases significantly eastward from the harbor areas toward the inland valleys of southern California. Additionally, 90% of quinones at receptor sites inland have been found to be photochemically formed during atmospheric transport,

thus increasing their toxicity [164]. This implies that children living near our ES may be at greater risk due to the combined exposures to transported regional air pollutants and railyard emissions. The SBR is the largest source of emissions in the immediately adjacent areas, with an estimated 22 tons of DPM emitted annually, doubling the 10.8 t/yr from all other off-site (mobile and stationary) sources together [13].

(4) Confounding. We carefully socio-demographically matched our CS to our ES and further adjusted for individual-level confounders known to influence respiratory health, such as exposure to ETS in the home and the amount of time the child spends outside. We also assessed the children's ability to access medical care. Finally, we adjusted for potential neighborhood differences that might exist and took into account proximity to traffic and emissions from other local sources.

Strengths and limitations. Our study has a number of strengths. The screening was offered to all children with parental consent from both schools and we had a high participation rate (74%). We used objective biological measurements from participating children, including PEF and $F_{ENO,}$ to assess respiratory health. The CS school was socio-demographically matched to the ES to allow for robust comparisons. Both schools were subject to virtually the same levels of regional air pollution, allowing us to assess risk in an environment already burdened by poor air quality. The data collection was conducted during a winter month when ambient air pollution is lowest in the inland areas of Southern California.

Our research also had some limitations. School location was used as a proxy of exposure and no monitoring data of ambient air pollution levels were available for this study. Future research studies should attempt to collect individual exposure measurements such as equipping children with backpacks that measure air pollution [105, 165], arguably a challenging but important next step. Another limitation was the difficulty of isolating the exposures to railyard-related emissions given the presence of other off-site sources of pollution in the community. However, previous research had already established that the railyard accounts for 66% of the on- and off-site DPM emissions [13]. Although adjustments were made to take these off-site sources into account, it is possible that other sources may have contributed more to the pollution than modeled. Another limitation, which may provide a conservative bias, is that the sickest children might not have been included in the study because they were absent from school during the screening. Lastly, the study results could be influenced by self-report bias for some of the covariates as well as residual confounding.

Public health implications. Freight logistics systems are considered a vital component of modern societies, and are generally seen as beneficial [1]. However, such benefits should not obscure the potential for societal impacts such as air pollution, noise, stress, loss of land, and blight that can burden local communities [2-4]. Only recently have scientists begun to point to the linkages between goods distribution and environmental and societal impacts [5]. The prospect that residents, especially children, who live near ports, rail yards, distribution centers, and along high-traffic corridors could be disproportionally impacted by higher levels of ambient air pollution has prompted the State of California to implement emission reduction strategies specifically focused on international goods movement [6]. Our study represents one of the first investigations into the concerns about the health effects of railyard-related emissions in children. Our findings are consistent with previous exposure studies which indicate that proximity to

traffic sources can negatively impact respiratory health in children. Current CARB guidelines recommend avoiding construction of new schools and homes within a mile of a railyard. In 2003, the California Legislature passed SB 352, which requires that a school district verify that any railyard within a quarter mile of a new school will not present a public health threat. However, decades ago when the schools were built, little was known about the health effects of air pollution and the nearby roadways, rail lines and facilities were not nearly as busy as they are today. Even though some older schools are not covered by these guidelines and legislation, public health professionals have a responsibility to consider the impact of these environmental conditions on growing children, especially on children from low income, minority households, where the main focus is on day-to-day survival. Emerging evidence suggests that children from stressed households are even more susceptible to the respiratory health effects of traffic-related air pollution [11, 12]. Other prospective studies, which include enhanced exposure assessment designs, are needed to verify our current cross-sectional findings.

Conclusion

The results from this study support the hypothesis that proximity to a busy goods movement railyard negatively impacts the respiratory health of children, even in an area already afflicted by poor air quality. Previous research and subsequent regulatory efforts have focused on ports and roadways and not goods movement rail facilities. More research is needed from prospective studies to assess the long term impact of rail facilities on children's respiratory health as well as other health outcomes. Ultimately, our findings lend support to the proactive direction taken by the state in instituting and promoting measures aimed at protecting residents of communities near the goods movement network.

Figure 1. Map of the study area, illustrating the location of the San Bernardino Railyard (SBR), and the two participating elementary schools in relation to the transportation infrastructure (railroads and roadways). The inset map displays the full geographic extent of the impact zones in relation to the study area (rectangle).

Table 1. Basic characteristics and main outcomes of participating children

		By School of Enrollment	
	All Subjects	Exposure School	Comparison School
	(n = 877)	(n = 435)	(n = 442)
Age, yr, mean ± SD	7.96 ± 1.8	7.97 ± 1.8	7.95 ± 1.8
Race/Ethnicity, n (%)			
Non-Hispanic White	42 (4.8)	19 (4.4)	23 (5.2)
Hispanic	732 (83.4)	356 (81.8)	376 (85.1)
African American	48 (5.5)	32 (7.4)	16 (3.6)
Other	55 (6.3)	28 (6.4)	27 (6.1)
Gender, male, n (%)	414 (47.2)	201 (46.2)	213 (48.2)
Grade, n (%)			
Kindergarten	128 (14.6)	74 (17.0)	54 (12.2)
1st	145 (16.5)	57 (13.1)	88 (19.9)
2nd	161 (18.4)	77 (17.7)	84 (19.0)
3rd	139 (15.9)	71 (16.3)	68 (15.4)
4th	156 (17.8)	81 (18.6)	75 (17.0)
5th	148 (16.9)	75 (17.2)	73 (16.5)
BMI, n (%)			
Underweight (<18.5 kg/m^2)	39 (4.5)	28 (6.4)	11 (2.5)
Normal (18.5 - 24.9 kg/m^2)	481 (54.8)	233 (53.6)	248 (56.1)
Overweight (25.0 - 29.9 kg/m^2)	144 (16.4)	71 (16.3)	73 (16.5)
Obese (≥30 kg/m^2)	213 (24.3)	103 (23.7)	110 (24.9)

Time spent outdoors, n (%)			
< 12 hours	359 (40.9)	183 (42.1)	176 (39.8)
12 – 24 hours	368 (42.0)	187 (43.0)	181 (41.0)
> 24 hours	150 (17.1)	65 (14.9)	85 (19.2)
Lived with smoker, n (%)	188 (21.4)	103 (23.7)	85 (19.2)
Distance to major road			
< 100 m	295 (33.6)	190 (43.7)	105 (23.8)
100 – 200 m	179 (20.4)	76 (17.5)	103 (23.3)
200 – 300 m	180 (20.5)	80 (18.4)	100 (22.6)
> 300 m	223 (25.4)	89 (20.5)	134 (30.3)
Peak Expiratory Flow (PEF)*			
Mean ± SD (L/min)	207 ± 61.8	201 ± 60.5	214 ± 62.4
< 80 % of predicted, n (%)	188 (22.4)	112 (25.8)	76 (17.2)
Exhaled nitric oxide FE_{NO}#			
Mean ± SD (ppb)	13.3 ± 15.1	13.7 ± 15.6	12.9 ± 14.6
≥ 20ppb, n (%)	141 (16.3)	76 (17.5)	65 (14.7)
Median household income, mean ± SD	43,726 ± 13,679	38,755 ± 12,704	48,618 ± 12,826
Diesel exposure, kg/day, mean± SD	7.96 ± 1.47	7.73 ± 1.81	8.19 ± 0.98

* Sample size = 840. # Sample size = 867

TABLE 2. LINEAR REGRESSION AND LOG BINOMIAL MODELING. RESULTS OF CHILDREN AT THE EXPOSURE ELEMENTARY SCHOOL (ES) EXPERIENCING ADVERSE RESPIRATORY RELATED HEALTH OUTCOMES IN CONTRAST WITH THE COMPARISON ELEMENTARY SCHOOL (CS)

	All Subjects				Sensitivity Analysis**		
Linear Regression Analyses			Crude	Adjusted*			Adjusted*
Health Outcomes	N	Events	β (95% CI)	β (95% CI)	N	Events	β (95% CI)
PEF Test Results	877	188	-12.8 (-21.0, -4.66)	-14.9 (-22.2, -7.58)	765	161	-13.0 (-20.8, -5.20)
FE_{NO} #	867	141	0.00 (-0.10, 0.11)	-.01 (-0.13, 0.11)	759	129	0.03 (-0.10, 0.16)
Log Binomial Analyses			Crude	Adjusted*			Adjusted*
Health Outcomes	N	Events	PR (95% CI)	PR (95% CI)	N	Events	PR (95% CI)
PEF Test Results < 80%	877	188	1.50 (1.16, 1.94)	1.59 (1.19, 2.12)	765	161	1.41 (1.03, 1.92)
High FE_{NO} $\geq$ 20ppb	867	141	1.19 (0.88, 1.61)	1.33 (0.96, 1.86)	759	129	1.44 (1.02, 2.02)

3

Abbreviations: β = regression coefficient; 95% CI = 95% Confidence Interval
* Model=school, age, gender, race, environmental tobacco smoke (ETS), time spent outdoors, medium household income, proximity to nearest major road, total diesel pollution.
**Sensitivity analysis included only subjects residing more than 6 months at their current address.
Log of FE_{NO} + 1

4.2 Parent-Reported Outcomes and Symptoms

In addition to the PEF and FE_{NO} outcomes reported in the submitted paper, we also conducted parallel analyses using log-binomial and logistic regression modeling (see below). Briefly, as in the analyses of the submitted paper above, we used the analyses on children at the exposure school who are experiencing adverse respiratory health and symptoms in contrast with the comparison school and compared endpoints using the two different analyses techniques (log binominal and logistic regression). The endpoints considered were: parent-reported asthma or inhaler use (PRA/Inh); parent-reported asthma or low PEF or high FE_{NO} (SA); cough; wheeze; and parent-reported child visit to Emergency Department for respiratory related problems within last year (ED). Low PEF was defined as < 80% of predicted value based on the age and height of child. High FE_{NO} (airway inflammation) was defined as ≥ 20 ppb NO. For reference, we have included in the same graph the log-binomial and logistic regression results obtained for PEF and FE_{NO} (see Table 2 immediately above). All models were adjusted for age; sex; race; exposure to ETS; time spent outdoors; neighborhood median household income; proximity to nearest major road; and total diesel PM from local (mobile and stationary sources).

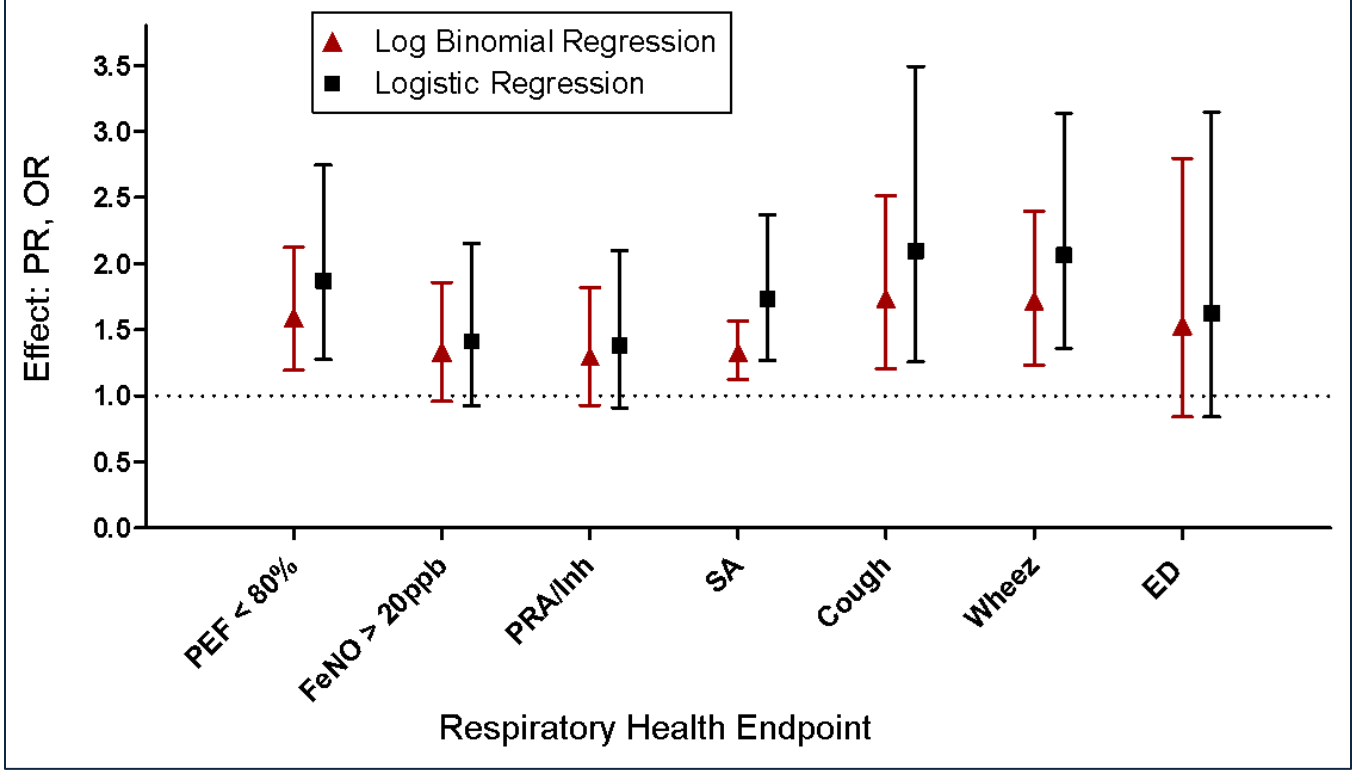

FIGURE 4-1. ADJUSTED PREVALENCE AND ODDS RATIOS OF ASSOCIATION BETWEEN SCHOOL EXPOSURE AND SELECTED RESPIRATORY HEALTH ENDPOINTS

Cough (PR = 1.74/OR = 2.09), wheeze (PR = 1.74/OR = 2.06), and parent-reported asthma/low PEF/high FE_{NO} (PR = 1.33/OR = 1.73) were significantly elevated according

to either regression approach. Non-significant elevations were observed for parent-reported asthma/inhaler use and ED utilization for respiratory related problems, PR = 1.30/OR = 1.40, PR = 1.53/OR = 1.63, respectively. Noticeably, log-binomial regressions produced more precise estimates, as indicated by the narrower 95% confidence intervals, compared to the logistic models.

CHAPTER 5: DISSEMINATION & MITIGATION STRATEGIES

5.1 Dissemination Activities

According to a most telling definition, the goal of public health is "to find ways to make people healthy before they are wealthy, and then keep them that way." In order to increase the visibility of our project and enhance its sustainability, while supporting its environmental justice dimension, we adopted a project name that reflected this intention and commitment, Project ENRRICH. ENRRICH is the abbreviation of **En**vironmental **R**ailyard **R**esearch **I**mpacting **C**ommunity **H**ealth. This name was selected from among more than 60 entries submitted by public health graduate students at our school. The adopted project name has been also used to designate the study's web site, which is available at http://www.enrrich.org. The web site contains information about the study and includes mechanisms for visitors to leave feedback and suggestions.

Since early in the study, research team members engaged in various outreach and dissemination activities. For example, the co-principal investigators participated in a roundtable event on the LLU campus organized by the LLU Center for Christian Bioethics. The topic of discussion at the roundtable was the BNSF San Bernardino Railyard as Case Study in Environmental Justice. In addition to the co-principal investigators, participants included San Bernardino City Mayor Patrick Morris, Dr. Tom Dolan, Executive Director of the Inland Congregations United for Change, and representatives of BNSF.

The co-principal investigators, who are members of the AQMD-sponsored San Bernardino Clean Communities Plan Working Group, have delivered special presentations on the ENRRICH Project at meetings of both groups where key stakeholders are represented. The ENRRICH Project has been also featured in a video interview conducted by AQMD with Dr. Beeson, a co-investigator in the study.

Coinciding with the beginning of the household survey data collection effort, we scheduled a press conference in collaboration with the City of San Bernardino. The event was intended to serve as the official launching of the study and to heighten awareness about the project among local residents. The press conference was held on June 8, 2011, at the Ruben Campos Community Center, which is located immediately adjacent to the SBR, and received wide media coverage on local, regional, and national media, including CBS, FoxNews, ABC and Univision, National Public Radio, The San Bernardino Sun, The Riverside Press Enterprise, The Los Angeles Times, and The New York Times. Television coverage featured live footage of the event and interviews with LLU research, officials, and residents. Among the City and County officials who participated in the event were Mayor Patrick Morris, LLU President, Dr. Richard Hart, and San Bernardino County 5th District Supervisor Josie Gonzales, who called on residents to join in the study and assist researchers in their efforts. and

Several members of the research team have also disseminated information about the ENRRICH study, including oral papers and posters, at several professional meetings. We list some of these activities below (a complete list can be found in the project references):

- Title: *Making the IRB Training Community Responsive: Project ENRRICH Experiences in Delivering on the CBPR Promise.* Conference: One Community One Environment Environmental Justice Conference, Detroit, Michigan, August 23-26, 2011.
- Title: *Community Perceptions of Living Next to a Major Railyard: The ENRRICH Project*. Conference: Annual Conference of International Society for Environmental Epidemiology, Barcelona, Spain, September 15-19, 2011.
- Title: *Environmental Justice for Railyard Communities:* A *CBPR Approach*. Conference: Annual Conference of the American Public Health Association, Washington DC, October 29, 2011.
- Title: *Community Health Impact Assessment: The ENRRICH Project.* Conference: Healthy Communities by Design Summit, Loma Linda, California, November 14 and 15, 2011.

5.2 Policy Development and Mitigation Activities

Important to a CBPR approach is the collaboration with community members to develop a sustainable response plan. Through focus groups, survey information, and adult and child health assessments, we have developed a platform for policy and mitigation activities based on the identified challenges and health needs among community members.

5.2.1 Policy Recommendations

For residents in areas such as west San Bernardino, near the SBR, the existing infrastructure can disproportionately affect residents' health. Regulation of interstate road and railway pollution has been traditionally under the Inter-State Commerce Clause and EPA regulations, though specific state laws provide scope for state and local agencies to implement mandates. However, this has led to only limited enforced regulations, especially near residential areas. While zero emissions should remain a working goal, interim steps in reducing diesel pollution are urgently needed. Project ENRRICH is advancing several policy recommendations that can address these needs when implemented through a collaborative effort of agencies at the local, state and federal levels.

5.2.1.2 Federal Policy Recommendation

The 1990 Clean Air Act provides a foundation for national emission standards. Exempt from applicability of such laws are railway locomotives, which are subject to separate EPA regulations for US emission standards for locomotives; applicable in two tiers: tier 0-2 standards for those manufactured from 1973, and tier 3-4 standards (effective from 2015). Data suggest that such general standards may not appropriately protect residents in close proximity to railyards, such as those living near the SBR. New standards to cover nearby residential areas are needed. Tier 3-4 standards require newly built or remanufactured locomotives to use exhaust gas after-treatment technologies which would help to protect residents, but few are used; existing locomotives need stricter regulations, especially when near residential areas. Currently BNSF has purchased several so-called "clean" engines. And while they are a step in the right direction, these cleaner engines are not necessarily *consistently* located in railyards with high potential residential impact. To reduce exposure experienced by local community residents, we suggest 1) retrofitting existing engines with emission control systems, and/or 2) replacing more existing engines with newer models that have more protective technology or use natural gas engines, and 3) placing restrictions on the operation of existing equipment.

5.2.1.3 State Policy

In addition to federal policy recommendations, Project ENRRICH recommends enabling the Federal government to provide broader authority for state and local authorities in

regulating railways as per US Health and Safety Code Section 4300 (c) and 43000.5 (d and e). There is a need to promote environmental justice as an integral part of public health, thus expanding the state's role under the 14th amendment of the U.S. Constitution, allowing local agencies broader authority to protect public health and safety. We recommend mandating new zero/low emission technologies on all locomotives of California, as well as mandating the use of Advanced Locomotive Emissions Control Systems. We also suggest more stringent land use and zoning policies to prevent the construction or expansion of freight hubs in residential areas. For existing rail facilities, we suggest implementing stricter zoning laws, including efforts to mitigate air pollution affecting local residents as well as regulations limiting business license allowances based on emission standards. To encourage zero emission locomotives we recommend providing incentives, tax benefits, etc., for the use of these improved engines locomotives, which may be complicated by state or federal tax codes; however, it is important to make financially attractive for railway companies to upgrade their diesel locomotives to a "healthier" fleet.

5.2.1.4 Local Policy Recommendations

In addition to the Federal and state policy recommendations, there is the need to design, get approved and implement local policies that are more proactive in protecting the public's health. Because it is not realistic or reasonable for residents to move or for the railyard to move, we suggest investing in carefully planned, tiered vegetation/tree barriers as borders between the railyard and the local community. Currently there are no buffer zones between the two, and only recently, based on community concerns and pressure, has there been some movement toward such a vegetation buffer. As some mitigation efforts are beginning (BNSF has recently given some funding for a vegetation border for a limited section along their fence) we also suggest to putting in place a longitudinal monitoring system for health outcomes near high burden sites as well as directly monitoring the ambient air quality in several residential areas close to the railyard. There are too few monitoring stations to create a complete picture. All information collected through the monitoring data, as well as results from research studies and their implications for policy change, should be widely disseminated to community residents.

Noise pollution was an often noted concern by residents. There is the need to mandate stricter hours of operation to reduce continuous emissions and noise pollution. Residents who participated in focus groups and interviews were highly vocal about the noise from the railyard. As noted above, it would be helpful to build fences and walls, and plant vegetation borders wherever the railyard abuts residential areas to help buffer noise and block some pollutants. Since these efforts require funding and potentially changes in local regulations (or enforcement of existing ones) that may make the conduct of business more challenging in an area in dire needs for jobs, one should consider raising generalized license fees (area-wide) to assist the residential areas that pay for our access to cheap goods with their health. Similar to the tobacco tax, such a fee could then be used to benefit affected areas adjacent to railyards to help enact public health safety measures.

Clearly there is much to do and it is important to do this in partnership with the community and the railway industry. Residents are very supportive of industry; they simply would like to be healthy *and* able to work and support their families. Therefore there is the need to involve industry in efforts to protect affected communities. Recently, the ENRRICH team held a community meeting with the San Bernardino Rotary Club, which includes members of local businesses, to discuss the development of a vegetation border at the elementary school a few blocks from the railyard. A report by the National Environmental Justice Advisory (NEJA) council to the Environmental Protection Agency (EPA) titled "Reducing Air Emissions Associated With Goods Movement: Working Towards Environmental Justice," contains advice and recommendations about how the EPA can most effectively promote strategies, in partnership with federal, state, tribal, and local government agencies, and other stakeholders, to identify, mitigate, and/or prevent the disproportionate burden on communities of the air pollution resulting from goods movement [94]. Only through a coordinated effort from key government, business, medical and institutional agencies as well as support from impacted communities will improvements be implemented and sustained.

The health and environmental challenges faced by the community, which was the target of our study, are likely a common phenomenon faced by other communities, which are located near major goods movement facilities. Given the gravity of the situation and their challenges, the needs of these communities should be addressed by policy leaders and advocates, taking a Health in all Policies Approach (HiAP). According to the National Association of County and City Health Officials (NACCHO), HiAP is an innovative and strategic approach through which policies are created and implemented, emphasizing the need for input and collaboration across industry and sectors to ultimately achieve common health goals [115]. The enormity and complexity of the conditions faced by community residents support this approach to addressing their health and environmental challenges.

With this in mind we propose the following:

Reduce pollution at the San Bernardino railyard by developing and implementing a plan with target dates for:

- Converting trucks to alternative fuels
- Converting railyard equipment to alternative fuels
- Installing advanced new "cleaner" railyard technology and engines

In the immediate present, reduce residents' exposure from railyard pollution by-

- Creating buffer zones – walls and fencing
- Establishing truck routes away from densely populated areas
- Move the railyard entry gate away from the local community center and two local schools
- Expand current plans for a green vegetation border to trap emissions
- Continue to retrofit homes and schools with air filters and new windows

Though prevention efforts are critical and should be pursued through policy and legislation, we have identified significant health challenges for the most vulnerable in the community. Therefore, to improve health outcomes, we recommend that free asthma and respiratory health screenings and referrals for treatment be offered for young children. And while our adult health data findings were less clear, we recommend that free or reduced cost screening and health services are made available for residents, as well as health care for those requiring treatment.

To make this goal a reality, both LLU researchers and our community partners are committed to systematic planning and coalitioning efforts toward these outcomes. This includes:

- Developing a platform for action to address diesel pollution and health impacts.
- A task force of stakeholders, including representatives from 12 local, regional, and state agencies will continue to meet regularly.
- Develop and finalize intervention plans for reducing pollution levels and assign task force members to implement.
- A health response team with at least 4 health agencies will meet regularly and develop a health intervention plan.
- Also, in the next year, CCAEJ will begin work on a demonstration project to address air pollution and its health impacts in the west side neighborhood of the City of San Bernardino. The group plans to inform and engage local residents and continue outreach efforts to educate and inform 300 community members about health impacts from the railyard. Work with local health researchers/experts to develop clear, well-written educational materials in lay language that explain current research findings on the health impacts of particulate pollution.

5.2.2 Mitigation Strategies

Community Intervention

As part of the qualitative, community-based research methods employed by the Project ENRRICH team, we conducted a series of focus groups and key informant interviews to understand the community's needs and wishes, and also to inform the household survey which would be used in data collection. Residents were asked questions such as, "Is there anything you would like to see improved in your community?" Responses were then coded for recurrent themes and organized into categories. Results from the survey analysis showed that while air quality and health were concerns, residents had more immediate and tangible problems – issues with law enforcement, street lighting and repair, and the lack of trees and greenery. In the focus groups, community members gave several suggestions for improving their neighborhoods, which mirrored the findings from the household surveys.

The following are recommendations from community residents who participated in focus groups and completed household surveys:

Railyard Related

- Move the entrance of the SBR further away from homes. Participants reported this has been requested multiple times but no action has been taken. This issue was considered top priority.
- The railyard should take an active role in reducing the practice of semi-trucks idling in residential areas.
- San Bernardino Police should enforce existing ordinances prohibiting idling trucks in residential areas.
- Increase the use of less polluting, "clean engines" at the SBR.
- Implement regular air quality monitoring in the community, especially around the railyard.

Medical Services

- Provide greater access to regular and long-term free medical services in the community.

Community Programs

- Offer more programs at community centers to provide young people with activities and recreation, reducing the time they spend on the streets.

Increased Lighting

- Increase lighting as a way to reduce crime and make people safer in their surroundings.

Tree Planting Campaign

- Plant trees to encourage people to spend more time outdoors, improve aesthetics, and provide much-needed shade. Trees will also help block both noise and air pollutants.

Community-supported Activities

Through the ENRRICH Project we were able to work with the local community and to support needed and desired community improvements. The following includes a detailed description of the various community engagement activities:

Arrowhead Regional Medical Center Mobile Clinic Outreach. Through focus groups conducted with community members living near the railyard, we saw a strong desire for medical services in this underserved community. ENRRICH investigators facilitated the signing of a Memorandum of Understanding (MOU) between the San Bernardino County Arrowhead Regional Medical Center (ARMC) and City officials. Under this agreement, the ARMC's Mobile Clinic has established a regular schedule of monthly visits to the neighborhoods near the SBR to provide needed medical services and preventive care. The Mobile Clinic started providing free medical services on March 2013 at the Ruben Campos Civic Center, near the SBR. CCAEJ and ENRRICH continue their close involvement with this initiative.

Arrowhead Regional Medical Center Breathmobile®. Through the respiratory screening conducted in our two participating elementary schools, the research team saw first-hand the large number of local children with respiratory illness, or the risk of it.

As part of the group of organizations that made up Project ENRRICH, the Arrowhead Regional Medical Center Breathmobile® Clinic (BC) conducted the asthma and respiratory health screening at the two elementary schools which participated in the study. This mobile clinic currently provides medical care for respiratory health issues at a few schools in the Inland Empire; however, neither of the ENRRICH study schools were on the BC's schedule. Typically, a school nurse or other medical professional at the child's school will identify children suffering from asthma and recommend that the parents bring the child to the BC. The interior of the BC resembles a doctor's office, and is staffed with a licensed registered nurse, a respiratory therapist, a patient service worker and at times, a nurse practitioner or pediatric immunologist. Medical treatment provided by the BC personnel includes physical exams, free medications, spirometry, skin testing, and peak flow meter testing. Families are also educated on the proper use of medications, metered dose inhalers, peak flow meters, spacing devices, and nebulizer treatments as well as ways to make the home more "asthma friendly" through environmental control measures. Evaluation studies have demonstrated dramatic health improvement for patients treated by the BC, including fewer emergency room visits, improved pulmonary function, decreased school absenteeism, and improved quality of life. After the ENRRICH screening project, the BC offered to the exposure school near the SBR to their regular schedule. The school now receives regular visits from the BC.

Figure 5-1. Inside the Arrowhead Regional Medical Center Breathmobile Clinic

Parent Training for Asthma Management. As part of the ENRRICH screening effort at the two target elementary schools, all parents were contacted with the results of their child's respiratory tests. In addition, parents from both elementary schools were invited to informational sessions, conducted in English and Spanish, on how to manage their child's respiratory condition. Parent training sessions were held at both schools in the spring of 2013. The ENRRICH team also also provided asthma training to bilingual community health workers, *promotores de salud,* who are skilled at connecting with

hard to reach populations, enabling them to provide information to parents on an ongoing basis. The *promotores* trainings took place on February 12, 2013.

Asthma Award for School Principal. For his support and work with Project ENRRICH, the project team nominated Mr. Luis Chavez-Andere, at the time Principal of the elementary school near the SBR, for the 2012 Air Health Award of Achievement for his work in promoting an asthma friendly school. *California Breathing*, a California Department of Public Health asthma program, gives the Air Health Awards. He was one of 12 elementary school principals selected across the State of California to receive the award, which was presented during a City of San Bernardino City Unified School District Board meeting. LLU researchers also presented him with a check for $1,500 raised through a silent auction held at the LLU School of Public Health. The funds were to be used for any school-related need or project the principal chose.

LLU SPH First 5 Riverside Asthma Program. Building on the experience gained through the ENRRICH project, some members of the research team developed a comprehensive asthma screening and educational program, which was submitted for funding to First 5 Riverside County; the proposal received a four-year contract (2012-2016) for $1.6 million. For this program, we elected to partner with a local community organization, El Sol Neighborhood Educational Center, which utilizes community members for health education presentations. These *promotores de salud,* or health promoters, are especially effective in providing vital health information to hard-to-reach and/or language isolated, underserved segments of the population. Through the program we are expecting to screen thousands of children for asthma and connect them to needed health care services.

The LLU SPH Asthma Education Program (AEP) is a comprehensive, wrap-around package that includes respiratory health screenings for some of the most geographically "risky" children (due to proximity to local air pollution sources) combined with education for the children, their parents/guardians, child care and medical providers about the risks and how to avoid further progression of disease. Using GIS, we have targeted services geographically to "risky" areas with high Emergency Department (ED) utilization, high concentrations of children under 5 years of age, and poor air outdoor quality (i.e. high monitored pollution levels, near traffic and other local pollution sources, etc.). Our overall program design strategically includes four major asthma intervention and educational training components including: 1) asthma education (for children, parents, and child care givers; 2) asthma screening of high risk children with medical referral for those in need; 3) child care facility "asthma friendly" site assessments; and 4) sustainability and policy development. The AEP is aimed at training both children and adults. Children attending a child care facility receive education about asthma through an age appropriate entertaining play and/or puppet show at the child care facility and augmented by educational materials. Children are then participate in asthma health screening and if identified to be at risk, are referred to follow-up medical care. The parents of children identified as having high risk for asthma, are invited to participate in an after-school educational program about follow up preventive care and tips to avoid progression while managing the disease more optimally, thus avoiding

crisis episodes. We also provide asthma training to child care facility personnel to better understand asthma, including common triggers and basics about asthma management. Each participating child care facility receives an indoor environmental evaluation to determine if they are an “asthma friendly” site. LLU provides certification to the schools recognizing them as meeting the “asthma friendly” requirements. A subsample of the child care facilities, namely those located in the areas of highest pollution exposure will receive more in depth indoor and outdoor facility site assessments, including air pollution monitoring, to evaluate them for potential environmental triggers and develop plans with the respective Center Directors to help them mitigate their facilities’ exposures. Process and outcome data from all parts of our wrap-around program will be used to determine the effectiveness of the individual program components and to support policy development toward childhood asthma prevention and management.

A unique aspect of the program is the theatrical education component involving stage plays as well as puppet shows. We developed a creative theatrical program to promote a variety of health topics in an educational, but entertaining way. Research indicates that children tend to pay greater attention to what puppets say even when they might not pay attention to a teacher. They also tend to take to heart the things a puppet/or character says more so than when it comes directly from an adult. The play is intended to not only educate the children about asthma, but to also provide information on a healthy lifestyle. Depending on the size of the area at each of the child care centers, the theatrical play can also be adapted to be presented as a puppet show as well. The LLU copyrighted play “Captain Jack Snuffles and the Coughing Crew”, is about pirates with asthma and written for an audience of young children. The play can be conducted in either English or Spanish depending on the needs of the community observing the performance.

FIGURE 5-2. CAPTAIN JACK SNUFFLES’ EDUCATIONAL PLAY PRESENTED AT AN ELEMENTARY SCHOOL IN SAN BERNARDINO. THE PLAY TEACHES CHILDREN AND ADULTS THE A-B-C’S OF ASTHMA AND AIR QUALITY.

Early childhood interventions are critical to address the explosion of asthma related diseases that are costly to individuals, families and government. Only an intentional coordinated approach that leaves behind supportive policies, expertise, and response-

ready individuals promises some containment of individual suffering and health care costs associated with asthma.

Support for a Vegetation Border. With information gained through focus groups and key informant interviews we identified the desire to develop a vegetation border for the ENRRICH exposure school near the SBR to help potentially block air and noise pollution from reaching the school grounds. **Figure 5-3** below shows the school playground, which is the closest part of the school to the SBR. Positive input was received from the school principal, parents, community members and community stake holders, supporting a school based plan targeting air pollution exposure reduction through use of a vegetation border. On June 6th, 2012 a group of health educators with the ENRRICH Project presented to the local Kiwanis Club, group of many local businesses, on the vegetation border development. They were very keen on supporting the project and asked to be appraised regularly on the progress. A number of additional meetings have been convened to support development of a vegetation border:

- Cal Poly Pomona Department of Landscape Architecture: An expert offered advice and special considerations for effectiveness and aesthetic aspects of the border.
- UC Riverside Botanical Gardens: Experts provided recommendations for the most child-safe tree and plant species.
- We also presented a poster with work on the vegetation border development at the NIH health disparities conference 2012.

FIGURE 5-3. THE RAMONA ALESSANDRO ELEMENTARY SCHOOL PLAYGROUND YARD, WHICH IS CLOSEST TO THE RAIL YARD, IS BORDERED BY A METAL FENCE.

Figure 5-3 shows the scarcity of trees on the school grounds. Shade cover is minimal and the majority of the playground is open grass. It is important to note that the playground is on south side of the school, closest to the SBR. Figure 5-4 illustrates the close proximity to the SBR from the school campus.

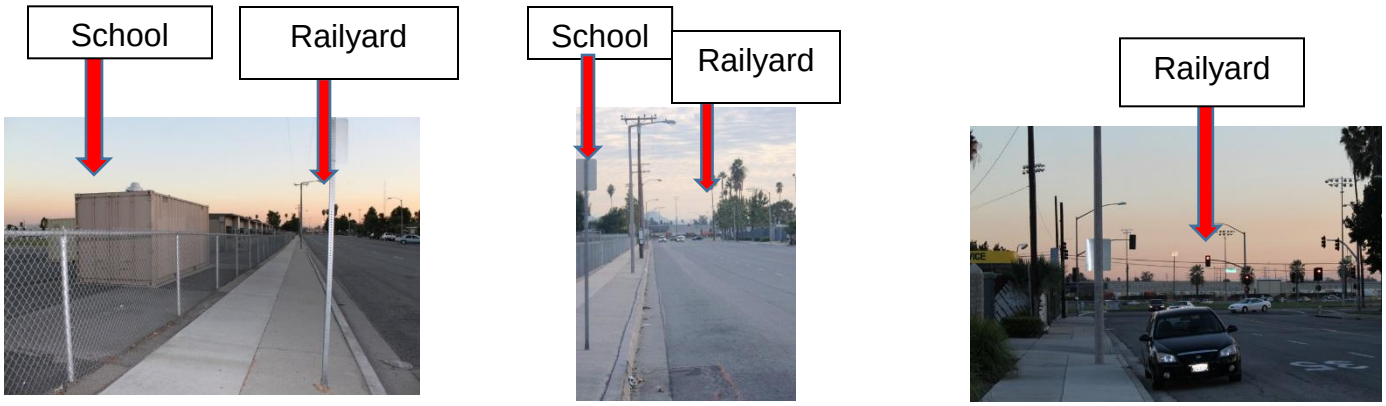

FIGURE 5-4. THREE PHOTOGRAPHS ILLUSTRATING THE CLOSE PROXIMITY OF RAMONA ALESSANDRO ELEMENTARY SCHOOL (LEFT) TO THE BNSF RAILROAD

Other Ongoing Initiatives. BNSF has donated $250,000 towards a traffic-calming project on the street immediately north of the railyard. Two genset switch locomotives have been funded by CARB under the U.S. EPA Diesel Emission Reduction Act. Also, in 2010 the SCAQMD launched the ambitious *Clean Communities Plan* to address exposure to air toxics at the community level and develop plans and solutions involving technology and policy actions through cross-sector partnerships and collaborations. The City of San Bernardino was chosen as one of the two pilot studies where AQMD staff is engaging with community stakeholders to identify and develop solutions community-specific to air quality issues. The ENRRICH Study itself is framed within the overall *Clean Communities Plan.*

CHAPTER 6: DISCUSSION & CONCLUSION

Concerns about health risks associated with elevated exposures to diesel air pollution near goods movement hubs prompted a pollution reduction agreement between CARB and the major rail companies operating in the State. The agreement was launched in 2005 with the goal of achieving diesel emissions reductions in areas near the major California railyards (**Figure 6-1**). As part of the agreement, HRAs were conducted at 18 major railyards in the State, including the one located in the City of San Bernardino. The ENRRICH Project was established out of concerns stemming from the release of the CARB's HRA, which pointed to the potential for enhanced health risks among residents near the SBR.

HRAs —based on a combination of empirical environmental data, toxicity information, and mathematical modeling— are estimates of the potential health impacts on a population at large. HRAs however do not collect data on specific individuals or residents to assess the burden of disease. Together, the ENRRICH study findings shed light on the potential relationship between increasing proximity to the BNSF Railyard and likelihood of experiencing adverse health outcomes.

FIGURE 6-1. DESIGNATED RAIL YARDS UNDER THE CALIFORNIA RAILROAD POLLUTION REDUCTION AGREEMENT.

The study region is an area notorious for long-standing poor air quality and health disparities. A comparison of reported asthma diagnosis for our entire study population, both children and adults, with asthma prevalence statistics reported for the entire San Bernardino County and the State of California, reveals increased adverse respiratory health burden across the ENRRICH Project populations (**Table 6-1**). In comparing the percentage of parents reporting that their child had a physician diagnosis for asthma, the overall asthma prevalence inferred from our study (12.8%) is higher than both the prevalence for San Bernardino County (12.2%) and California (11.6%) [166]. For adults, 12.6% of our study population reported a physician diagnosis for asthma compared with only 7.6% prevalence for both San Bernardino County and the State. These statistics suggest that residents in the ENRRICH study region experience respiratory health challenges. However, despite these shared challenges faced by our study populations, findings from our analysis by exposure site suggest that the community members living in closer proximity or attending school near the SBR may be experiencing an even greater health burden when compared to residents in areas further away. We recapitulate and discuss below the key findings from the three sub-studies of the ENRRICH Project: population-based cancer assessment; household health survey of adults; and elementary school-based assessment of respiratory health of young children.

TABLE 6-1. SELF-REPORTED, PHYSICIAN DIAGNOSIS FOR ASTHMA FOR ADULT PARTICIPANTS IN THE ENRRICH STUDY COMPARED WITH STATE AND COUNTY PREVALENCE.

	Region					
			ENRRICH Study			
	California	San Bernardino County	Total Population (n = 119)	High Exposure (n = 42)	Moderate Exposure (n = 38)	Background (n = 39)
Asthma Prevalence	7.6%	7.6%	12.6%	14.3%	11.3%	12.3%

6.1 Population-based Cancer Assessment

Our assessments of observed and adjusted expected counts of new cancers among residents of the SBR exposure areas identified mixed findings of deficits, no difference and excesses in observed counts of new cancers compared to expected numbers in some race/ethnic groups and by sex. Some of the observed elevations were small and non-significant while we also found statistically elevated numbers of observed new cancers. Disparate findings for the race/ethnic groups and between the sexes and contradictory findings for the three excess exposure zones do not provide clear evidence that exposure to airborne emissions from the SBR elevate cancer occurrence in the surrounding community.

The most remarkable findings were the higher than expected counts of new cancers identified among Hispanic females and males and for non-Hispanic white males for the combined railyard exposure area, and the decreased risk among Asian/Other residents of this combined exposure area are worthy of further exploration. Factors such as residence times, differential past/current smoking and socioeconomic patterning may account for some of the observed excess cancers, particularly among non-Hispanic Whites and Asian/Other groups. However, findings for higher than expected observed counts for new cancers among Hispanic males (all cancers) and females (all cancer sites combined and breast cancer) is largely unexplained and may provide the strongest evidence that excess air pollution emissions from the SBR could contribute to an excess in observed cancer counts.

Overall, the significant elevations that were observed would be considered to be weak (SIRs < 1.5) to moderate/strong (SIRs > 1.5) by conventional epidemiologic standards, but they are not trivial from a public health perspective and in tune with the magnitude of effect observed in a good number of environmental epidemiologic analyses. As a general principle, while it is true that the greater the magnitude of risk, the less likely the association is to be spurious or due to confounding bias, a causal association should not be ruled out simply because a weak association is observed.

The picture that emerges from our cancer assessment is certainly complex, including both intuitive and not altogether intuitive findings. Its multifactorial character, different etiologies, and variable latency periods make cancer a challenging biological endpoint in air pollution health assessments. Our findings might also be confounded by differences in presence, level, and duration of risk factors such as tobacco use between the sexes, race/ethnic groups, and according to income, education, and cultural subgroups that likely exist in the railyard exposure areas and the standard population.

In addition, a number of known factors may influence the susceptibility of the population and thus may impact population risk. Our investigation did not include information on previous residence history or duration of residence in the study area or the standard population, although we have provided in this discussion some estimates of residence length, based on the ENRRICH household survey, which seem to point towards residential stability among Hispanic and non-Hispanic white residents.

In spite of its limitations and the intricacies inherent to the exposure setting, our design included adjustments for age, race, sex, and population size changes. A clear-cut, unambiguous association between exposure to excess emissions from the SBR and elevated cancer risk among nearby residents cannot be firmly establish from our analysis. However “no risk has been shown” is not a statement that can be made either, mainly, in light of the findings for Hispanic residents.

6.2 Adults—Community Health Assessment

We explored health risks of living in close proximity to the SBR, a goods movement rail hub, in an urbanized area of inland southern California. Specifically, we assessed the relationship between air pollution near the SBR and outlying areas further away from the facility and adverse health effects among nearby adult residents in an area already impacted by regional air pollution. Our results suggest that residing in close proximity to the railyard had small but detectable effects. The results were not statistically significant, although some of the associations were borderline significant.
The magnitude of the effect across endpoints increased with closer proximity to the railyard within the REZ, from the *Moderate* to the *High* exposure region, suggesting a dose-response trend.

There are several limitations to our study. Outcomes were determined and analyses were conducted cross-sectionally. Therefore a cause-effect relationship cannot be established. Another limitation is that residential proximity was used as a surrogate measure for exposure to diesel emissions, which may lead to the possibility of misclassification of railyard-related air pollution exposure. Any non-differential misclassification of exposure however would be likely to bias our results toward the null.[xxi]

[xxi] Bias towards the null implies that if there is an association between exposure to railyard emissions and a given health outcome, it tends to minimize it regardless of whether it is a positive or negative

Our models adjusted for relevant confounders including age; sex; race/ethnicity; neighborhood-level household income; exposure to ETS; tobacco use; time spent outdoors; proximity to traffic; and diesel emissions from local (mobile and stationary) sources. Notwithstanding its methodological limitations, we believe that the public health implication of our investigation is that adult residents near major goods movement hubs should be protected from potentially damaging exposures.

6.3 Children−Elementary School Assessment

Our school-based study found that children attending school closer to the SBR were more likely to exhibit adverse respiratory health outcomes. Our findings revealed that children attending school near the railyard exhibited higher airway inflammation measured by F_{ENO} (PR = 1.33, 95% CI: 0.96, 1.86); findings were stronger among children who had lived at least 6 months at their current address (PR = 1.44, 95%CI: 1.02, 2.02). Significant effects were also seen for airway obstruction measured by PEF among children attending school near the railyard (PR = 1.59, 95% CI: 1.19, 2.12). Overall, the association with inflammation was less clear. While children at the exposure school, who had lived for at least 6 months at their current address, were more likely to have values suggesting inflammation (F_{ENO} >20 ppb) (PR=1.44, 95% CI: 1.02-2.02), linear regression analysis did not show this to be statistically significant. That said, additional log-binomial and logistic regression analyses revealed that children attending the exposure school were more likely to be diagnosed with asthma or experience adverse respiratory symptoms; they also were more likely to be taken to the emergency room for a respiratory event. Together the findings indicate that children attending school near the SBR are more likely to exhibit adverse respiratory health outcomes than children attending a socio-demographically matched elementary school located seven miles away in a similar urban setting. **Table 6-2** presents statistics comparing asthma prevalence among children attending the ENRRICH study schools to the prevalence childhood asthma in San Bernardino County and California.

TABLE 6-2. PARENT-REPORTED, PHYSICIAN DIAGNOSIS OF ASTHMA AMONG CHILDREN IN THE ENRRICH PARTICIPATING SCHOOLS COMPARED WITH STATE AND COUNTY PREVALENCE DATA.

	Region				
			ENRRICH Study		
	California	San Bernardino County	Total Participants (n = 136)	Exposure School (n = 77)	Comparison School (n = 59)
Asthma Prevalence	11.6%	12.2%	12.8%	14.5%	11.0%

association (see Vogel C, Gefeller O. Implications of nondifferential misclassification on estimates of attributable risk. Methods Inf Med. 2002; 41:342-8).

6.4 Key Points for Discussion of Observed Associations

The most fundamental question residents, local authorities, public health agencies, and scientists wonder about is whether or not the railyard facility contributes to overall disease burden in the areas surrounding the SBR. Underlying such question there are in turn two interrelated questions that need to be ascertained. First, is there evidence of increased adverse health outcomes among residents in close proximity to the SBR, compared to the populations in the background regions outside the RIZ? Second, is it conceivable that the SBR contributes to excess health risks in adjacent areas? We consider these two key questions next.

A negative answer to the first question (i.e., "no risk has been shown") would suggest that further examination of the second question is not warranted. An affirmative answer to the first question however need not be automatically ensued by a "yes" to the second question. There is the possibility that a greater burden of disease among residents might be associated with factors or conditions (e.g., smoking prevalence) unrelated to excess diesel emissions but which also intensify in magnitude towards the railyard.

Pervasively high levels of background, transported air pollution and emissions from local sources, together with underlying respiratory health challenges and relative socioeconomic/ethnic homogeneity, define an overall exposure setting within which, *a priori*, it might be difficult to find a distinct pattern of adverse outcomes with respect residential proximity to the SBR. Despite this, we were still able to detect consistently elevations with respect to increasing proximity to the SBR. Not unexpectedly, the health effects were stronger for children than for adults, but, overall, the consistent trend across endpoints appears to fit the expectation of enhanced exposures in the areas near the SBR facility. Data collected through ENRRICH suggest that some community indicators to improve away from the SBR and degrade with proximity towards it, including factors such as income, unemployment, access to health care, or ambient noise. Therefore, it could be argued that the observed higher prevalence of adverse health outcomes is not associated with excess emissions from the railyard but with conditions such as economic disadvantage, residential instability, or even lifestyle factors such as tobacco use, which has been traditionally with lower socioeconomic status. . However, we controlled for as many of these potential effects as possible thus limiting the potential for these assumptions to drive our findings.

Furthermore, we have already discussed in this report that, according to our household survey data, residential stability was comparable across our sampling zones and that other relevant factors such as exposure to ETS, or past and current tobacco use, actually decrease towards the SBR. It is well known that smoking, a critical risk factor for cancer, respiratory, and cardiovascular health, confounds the associations with air pollution. However, again, as suggested by our household survey data, our exposed zone does not appear to be an area characterized by higher smoking prevalence compared to the background regions. These self-report data are further validated by consumer data from the U.S. Bureau of Labor Statistics from the year 2010. Using these data, we have estimated that per capita annual expenditures on smoking products

in the REZ (i.e., near the SBR) amount to $63, compared to $110 in San Bernardino County at large. In summary, the elevations in risk in children and adults were identified against a general setting of residential stability and low smoking prevalence. Elevations remained after analytical adjustments for tobacco use, exposure to ETS, and for socioeconomic differences across the study population.

Although a cause-effect relationship cannot be established given the cross-sectional nature of our study, it is legitimate to assess whether reasonable correlational evidence exists. In gauging the increased adverse health outcomes identified through the ENRRICH, our results should be considered in light of the following considerations: 1) the SBR as a putative source of emissions vis-à-vis the potential contributing role of other local sources; 2) biological plausibility; 3) patterns of enhanced exposure and toxicity in the SBR region; and 4) confounding. We have already discussed these issues in some detail in the context of the three sub-studies presented in Chapters 2, 3, and 4. We summarize below the key points.

1. The SBR, a major local source of diesel PM. Although the SBR was identified as a source of hazardous air pollutants through the SRPRA (see *Introduction* section), the question as to why this goods movement hub has been singled out in the ENRRICH Project continues to be posed by many. It is therefore important to contextualize the SBR vis-à-vis the local setting of air pollution sources. As presented in Chapter 1, a variety of stationary and mobile sources are found in the immediate region surrounding the SBR, therefore contributing to the overall levels of air pollution in San Bernardino. However, the SBR is the largest local emitter of diesel PM. The emissions attributable to the SBR represent 67% of the total diesel PM emissions arising from all stationary and mobile sources within one mile of the railyard facility. This high onsite-to-offsite emissions ratio is unique to SBR. At the other major California rail facilities, onsite emissions tend to pale in comparison to those attributable to nearby offsite sources. Based on data for the other 17 SRPRA railyards, we have estimated that railyard-related diesel emissions represent on average 22% of all diesel emissions at a given facility. In addition, the absolute amount of diesel emissions, 22 tons annually, attributed to the SBR ranked fifth among the 18 California railyards assessed by CARB. Thus, the plausibility that the SBR may represent a health hazard for the local populations can be predicated on its relative and absolute contribution to local air pollution, in combination with its location in a densely populated area in San Bernardino.

2. Biological plausibility. Given the status of the railyard facility as a major local source, the next fundamental issue to consider is whether there is the evidence that the emissions associated with freight railyards exert detrimental human health impacts through plausible physiological mechanisms. Diesel exhaust is the dominant TAC that has been associated with SBR and the other railyards assessed by CARB. Diesel exhaust is a complex mixture of pollutants composed of vapors, gases, and fine particles. As presented in the *Introduction* section and in Chapters 3, 4, and 5, emerging epidemiologic evidence is establishing that ambient PM and diesel exhaust particles are associated with a variety of respiratory and cardiovascular problems and

increased risk of adverse respiratory health outcomes in children.[xxii] The physiological mechanisms underlying the health effects of diesel PM are gradually being elucidated. Current evidence indicates that inhalation of diesel particles enhances allergic and inflammatory airway responses [161]. Because of their small size, diesel particles can enter systemic circulation and gain entry to cells and tissues, altering or disrupting normal cellular function. Emerging evidence indicates that the primary etiologic agents from fossil fuels are pro-oxidant pathways, which induce cellular oxidative stress, and electrophilic activity that leads to irreversible binding with proteins and DNA [162, 163]. The immunologic evidence and the proposed cellular mechanisms fit well with the epidemiologic evidence indicating that exposure to diesel pollution is likely to enhance the risk for adverse health effects.

3. Patterns of enhanced exposure and toxicity in the SBR region. The SBR represents a unique, complex setting where local and regional air pollution processes intersect. It is important to assess how concentrations and relevant pollutant properties vary in space from sources and in ambient air, and the implications of such variations for exposure in local populations. Recent evidence demonstrates a distinct spatial gradient within the South Coast (Los Angeles) Air Basin with respect to the content of certain organic species found in diesel particles. Specifically, the concentrations of quinones, which play a critical role in eliciting oxidative stress-dependent cytoxicity in human pulmonary tissue, seem to increase significantly eastward from the coast towards the inland valleys of southern California. Not only do these concentrations increase eastward, but also it has been established that the vast majority (90%) of the quinones that can be measured at inland locations are photochemically formed during atmospheric transport [164]. This implies that the region where the SBR is located is at greater risk due to the oxidation of the organic species, which enhances their toxicity, as they travel inland. The plausible scenario is that residents near the railyard are likely to receive the combined exposures from the diesel-related pollutants traveling inland and the local emissions arising from the SBR. Nearly half of the participants from the elementary school near the railyard reported residential locations within 600 m of the northern sections of the SBR, where most emissions occur, and immediately south of the school campus. In addition, emerging results from a study recently conducted by UCLA scientists indicate that pro-oxidant activity, which will lead to adverse health effects, was greater in ambient air samples collected near the SBR compared to samples taken at the Long Beach and Commerce railyards. This finding implies increased toxicity of the air pollution to which local residents near the SBR are exposed, compared to other goods movement railyards further west in the Basin.

4. Confounding. To control for confounders or other factors, which can increase, decrease, or obscure attribution of the health effects from the ambient exposures, our models adjusted analytically for economic differences across our sampling zones; age; sex; race; smoking status and ETS exposure; time spent outdoors; exposure to local (stationary and mobile) sources of diesel PM and residential proximity to busy roads. Also, in the children's (school) study we identified a comparison elementary school, which was socio-demographically with the communities

[xxii] See for example references 19, 24, 26, 135, 157, 159, 160, 167, and 168.

neighboring the SBR. Like with the household-level study of adults, we further adjusted for individual-level confounders that are known to influence respiratory health, such as exposure to ETS in the home and the amount of time a child spends outside. Through the parental survey we also assessed the difference among the children from the two schools in their ability to access medical care and found no significant differences. Within our modeling strategy, we also adjusted for potential neighborhood-level income differences that might exist, even though the schools are only seven miles away from each other. Finally, we also took into account air pollution from other local sources, including the nearby roadways and other local sources.

In summary, with respect to the first key question ("is there evidence of increased adverse health outcomes among residents in close proximity to the SBR, compared to the populations in the background regions outside the RIZ?") posed at the start of this section, the findings from the ENRRICH Study point to elevations in the prevalence of adverse health outcomes among adult residents in the neighborhoods in close proximity to the railyard. Children attending school and residing near the SBR are more likely to exhibit evidence of respiratory dysfunction. With respect to the second key question ("is it conceivable that the SBR could contribute to excess health risks in adjacent areas?"), we have established the status of the SBR as the largest local emitter; the biological plausibility for adverse health effects of diesel exhaust; and the existence of patterns of enhanced exposure and toxicity in the SBR region.

6.5 Community Perceptions

In addition to the quantitative data collected through the school and community assessments, the collected qualitative information also provides insight into the challenges faced by community members living in close proximity to the SBR. When conducting the key informant interviews and focus group discussions with community members, it became quite apparent that though the community members expressed concern for poor air quality, for most of them other challenges took priority (i.e. jobs, providing for families, access to healthcare). For them, the railyard was seen as both an asset and a barrier to their ability to live a better life. Participants felt that the railyard has a positive reputation and is highly valued for the jobs and economic growth it provides for some. The reality is however, that few jobs are held by residents living in close proximity to the railyard. On the other hand local residents are indeed frustrated by the railyards role as a major contributor to the noise pollution as well as its potential role as a major contributor the surrounding poor air quality. Several participants believe that living in such close proximity to the railyard has caused ailments in family, friends, and neighbors, as well as themselves. None of the community members participating in our study wanted the railyard to close or relocate. Many expressed a strong desire for the railyard to "step up," be a good neighbor, and make reasonable changes to help protect the surrounding community from the noise and air pollution it generates. Attendees felt that the railyard does not listen to suggestions (i.e. alternate routes, more updated equipment) from residents about ways to reduce the impact their facility has on the surrounding community. Some participants feel that they have sacrificed for the benefit of the railyard and are concerned about the health impacts of life near such a

busy railyard, especially for their children. Many participants had positive sustainable suggestions for improvements to their community and are eager and hopeful to see the changes implemented and sustained.

6.6 Conclusion

The results from the population-based cancer assessment were not conclusive and in some cases they defied a straightforward interpretation. However some of the findings for all cancers combined and for site-specific cancers, such as the statistical risk elevations for breast cancer among Hispanic residents near the SBR, warrant further investigation. The ENRRICH study has also identified a significant association with increasing proximity to the local railyard and adverse respiratory health outcomes among children, in an area already plagued with poor background air quality. Although not significant, results for adults follow the same trends toward negative associated adverse health endpoints in the *Moderate* and *High* exposure regions closest to the railyard. Our models adjusted for relevant confounders, and the fact that even after analytical adjustments we still found modest to moderate elevations across health endpoints does not appear to support a basic hypothesis of no association between residential proximity to the railyard and adverse health outcomes among local residents. We cannot exclude the possibility that the lack of statistical significance for the findings for our adult study population may simply be the reflection of insufficient statistical power. While not statistically significant, we feel that these findings for adults should be considered relative to their public health significance. As we have noted throughout the report, the described associations cannot be interpreted as representing a cause-effect relationship due to the cross-sectional nature of our design. Future research is warranted with follow-up studies assessing individual-level exposures and the long-term health risks associated with chronic exposure in order to confirm/disprove the associations suggested by our analyses.

Under complex scenarios at the interface of science and policy, such as the one concerning the ENRRICH Project, the criteria for practical action do not always match the scientific opinion or consensus on causality. Public health authorities are faced with the difficult task of determining, given the available evidence, if the exposure is sufficiently widespread and the health consequences serious. In the spirit of prevention, as mandated by their role to protect the public's health, public health authorities may be justified under certain circumstances to implement specific action even when faced with moderate, rather than conclusive, evidence.[xxiii] Notwithstanding its methodological limitations, we believe that the public health implication of our investigation is that residents near major goods movement hubs should be protected from potentially damaging exposures.

[xxiii] Using an analogy from the field of statistics: this would be the equivalent of emphasizing Type II error (i.e., a false negative) over Type I error (i.e., false positive), given the potential for negative public health consequences. In contrast, statistical analyses tend to emphasize Type I error.

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